Held down "impossible" job for months vs. days

They were asking the "impossible" at this big West Coast mine. The hose used in their big beneficiation plant must be tough enough to handle the flow of murderously abrasive iron-ore slurry. Yet it still must be flexible enough to follow a twisting, bending course down from the top of the seven-story structure.

So it's little wonder their first hose sprang numerous leaks almost immediately—was finished completely in about 45 days. It wasn't until the G.T.M. – Goodyear Technical Man—recommended his special ore-carrying hose that they got satisfactory service.

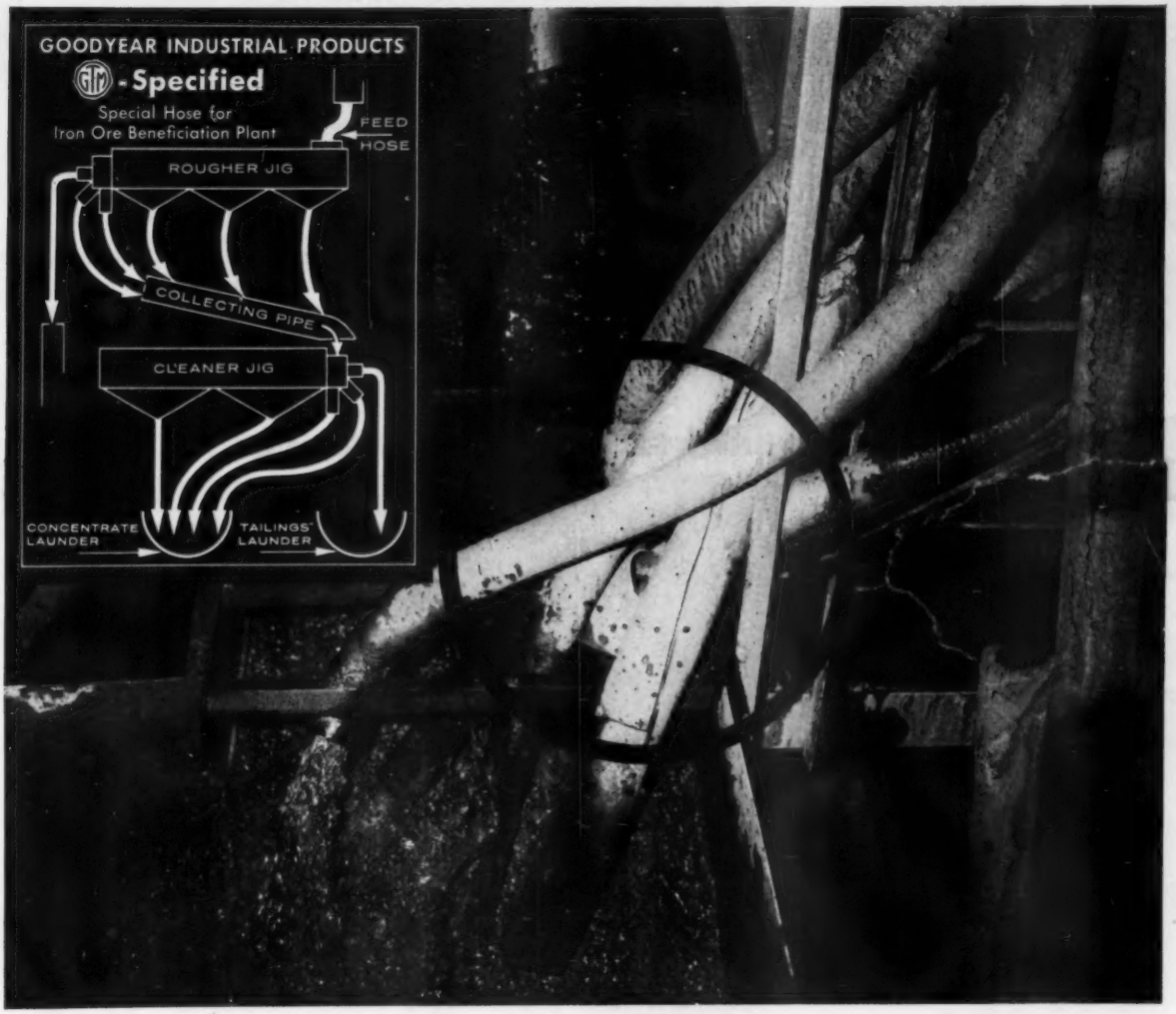
In fact, the G.T.M.'s hose has been so successful that the company's purchased over 4,000 feet of it to date.

It's been on the job over 12 months now – completely mastering this extra-tough job.

So once again, the G.T.M. has proved that the "impossible" often boils down to right hose – and the right recommendation. Make sure you get both—by contacting your Goodyear Distributor—or writing Goodyear, Industrial Products Division, Akron 16, Ohio.

• • •

IT'S SMART TO DO BUSINESS *with your Goodyear Distributor. He can give you fast, dependable service on V-Belts, Hose, Flat Belts and many other industrial rubber and non-rubber supplies. Look for him in the Yellow Pages under "Rubber Goods" or "Rubber Products."*



HOSE FOR ALL INDUSTRY BY

GOODYEAR

THE GREATEST NAME IN RUBBER

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'ROUND ABOUT

with the editors in field and office

Edited by R. L. Marinello

Can You Assist This Technical Trade School?

PLANT ENGINEERING recently received a letter from James R. Clemens, Plant Engineer, Link-Belt Co., Philadelphia, and a member of the Greater Philadelphia Chapter of the American Institute of Plant Engineers.

Mr. Clemens is enlisting the aid of engineers and industrial firms in trying to obtain needed equipment for the new laboratories and shops of the Williamson Free School of Mechanical Trades. A science building and four shop buildings are under construction and will be occupied for instructional purposes in September of 1959.

Just a brief rundown of some of the needed equipment is mentioned here: Small tools, instruments, desks, chairs, storage cabinets, bookcases and fire extinguishers for the Mechanical-Electrical Laboratory; sink fixtures, fume hood, blackboards, microscopes and scales for the Physical Science Department; various lathes, tool grinders, furnaces, air compressor, boring mill and numerous small tools for the Machine Shop.

If you would like to contribute something to this school, contact James R. Clemens, The Williamson Free School of Mechanical Trades, Media, Delaware County, Pennsylvania.

Conferences and Shows

SECOND NATIONAL Lighting Exposition will take place at New York's Coliseum, March 1 to the 4. Twelve panel discussions will be centered around the theme New Dimensions for the Foot Candle. Further information about the conference and show as well as tickets are available from National Lighting Expositions, 550 - 5th Ave., New York 36, N.Y.

The 1959 Corrosion Show of the National Association of Corrosion Engineers, held concurrently with the conference, will be at the Sherman Hotel, Chicago, Illinois, from March

Skubik Is Guest at Fluid Control Institute Meeting

Fall meeting of the Fluid Controls Institute, Inc., was held in Chicago. Pausing after a portion of the first day's activities is this group which included, from left to right: R. McCormick (vice pres., FCI) Automatic Switch Co., Florham Park, N. J.; J. R. Lawler, Jr. (vice pres., FCI) Lawler Automatic Controls Co., Mt. Vernon, N. Y.; Dean E. Madden (pres., FCI) A. W. Cash Valve Mfg. Corp., Decatur, Ill.; F. Weldon (vice pres., FCI) General Controls Co., Skokie, Ill.; E. B. Skubik, Associate Editor, Plant Engineering magazine; E. J. Osterhus, Fluid and Mechanical Engineering, Designers for Industry, Cleveland, Ohio.

Subscriptions: U.S.A. $10, Canada $11. Other countries $12 per year. Single copies $1. Change of address: Send to PLANT ENGINEERING, Circulation Division, Barrington, Illinois. Please supply position title, company name, company address. Request much reach us by 15th of month to make the change effective with following month's issue. Published monthly and accepted as controlled circulation publication at Chicago, Ill.

CAFETERIA—WEST PENN POWER COMPANY
Natco Ceramic Glaze Vitritile "6T" Series
Architects—
Hoffman and Crumpton, Pittsburgh, Pa.
Contractor—O. H. Martin, Sharpsburg, Pa.

Natco Ceramic Glaze Vitritile... choice of custodian—contractor—consultant and chairman of the board

SIZES AND SHAPES

Series	Shape Catalogs	Tile Face Size	Nominal Thickness
"8W"	8W-257	7¾" x 15¾"	2", 4"
"6T"	6T-657	5⅛" x 11¾"	2", 4", 6", 8"
"4D"	4D-1255	5⅛" x 7¾"	2", 4", 6", 8"

A versatile building material must meet the needs of the entire "team." For the cost-conscious executive who approves its purchase, Natco Ceramic Glaze Vitritile offers moderate initial investment, attractive appearance and long-term economy. Costly replacement and renovation are minimized because Natco Vitritile is resistant to acids, alkalies, fire and physical abuse.

Maintenance men prefer Natco tile interiors because they are easy to clean. Occasional soap and water cleansing insures a sparkling, new appearance for the life of the building. Its impervious finish makes Natco Vitritile the ideal material where sanitation is of prime importance.

For the craftsmen who install it, Natco Vitritile provides both structural strength and a handsome, permanent interior finish *in a single unit . . . placed in just one operation.*

Available in large unit face sizes as listed below. A complete line of shapes and sizes in both structural units and in "soaps" is further assurance that Natco Vitritile will adapt to any design.

Consult your nearest Natco branch office for complete details.

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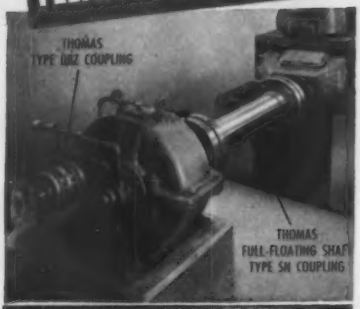

NO LUBRICATION
NO MAINTENANCE
NO WEARING PARTS

Future maintenance costs and shutdowns are eliminated when you install Thomas Flexible Couplings. These all-metal couplings are open for inspection while running.
They will protect your equipment and extend the life of your machines.
Properly installed and operated within rated conditions, Thomas Flexible Couplings should last a lifetime.

UNDER LOAD and MISALIGNMENT ONLY THOMAS FLEXIBLE COUPLINGS OFFER ALL THESE ADVANTAGES.

1 Freedom from Backlash Torsional Rigidity
2 Free End Float
3 Smooth Continuous Drive with Constant Rotational Velocity
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6 No Lubrication
7 No Wearing Parts
8 No Maintenance

Write for Engineering Catalog

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U.S.A.

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'ROUND ABOUT

17 to the 19. More information about the conference may be obtained by writing to R. W. Huff, Jr., National Association of Corrosion Engineers, 1061 M & M Building, Houston 2, Texas.

Fifth Biennial Chicago Electrical Industry Show will be held at the Hotel Sherman, Chicago, Illinois, from March 24 to the 26. If you would like more information, write to Electric Association, 140 South Dearborn St., Chicago 3, Illinois.

Air Conditioning Standard

RECOGNITION OF new duct materials is one of the important changes in the new standard on non-residential air conditioning and ventilating systems.

The standard covers duct materials other than metal, including flexible ducts and vibration isolation connectors. It also contains provisions applicable to the installation of ducts for high velocity systems.

Copies of the standard, Air Conditioning and Ventilating Systems of Other Than Residence Type (NFPA No. 90A, 24 pages, 50 cents) may be obtained from the National Fire Protection Association, 60 Batterymarch St., Boston 10, Mass.

Maintenance Sessions at University of Wisconsin

THE "second half" of the University of Wisconsin's Industrial Plant Maintenance Institute has been scheduled for March 12 and 13. This Institute session will deal primarily with the problems of plant engineering management.

Sponsored by the University Extension Division, with the assistance of the American Institute of Plant Engineers, the program is tentatively scheduled to cover such topics as the relationship between the plant engineer and general management, preventive maintenance and replacement policies, budgets and costs, training of maintenance workers, and business machinery in maintenance.

For registration information, contact R. L. Loetscher, Institute Coordinator, University Extension Div., Department of Engineering, University of Wisconsin, Madison 6, Wisconsin, or AIPE Headquarters, P. O. Box 185, Barrington, Illinois.

Four Easy Steps to Writing for Plant Engineering

THAT'S ALL it takes and Joseph W. O'Leary did just that in preparing the article "Why Adjustable Speed Drives?" which appeared in our October issue, page 124.

Mr. O'Leary is in the D-C Motor and Generator Department of General Electric Company, Erie, Pennsylvania.

The four steps, pictured below, are: Step One is researching data for the article. Step Two is putting all the facts on paper. Step Three (most important to the recipient) receiving the check in payment for the article. And Step Four (a very proud moment) is having the article appear in print.

New addition to the line of Grinnell malleable iron hangers

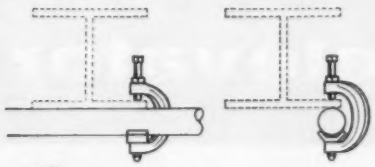
Grinnell's Malleable Iron G Clamp Hanger is a new addition to the line of Grinnell Pipe Hangers and Supports, the most complete line of any manufacturer. This hanger answers a long-felt need for support of pipe or conduit (up to 4 inches in size) where application can be made directly under structural steel.

The saddle of the Grinnell G Clamp swivels. This permits pipe or conduit to be installed either parallel or traverse to the beam axis. Separate beam clamp, rod and pipe clamp are not required, thus saving cost of supports and installation time.

Grinnell G Clamps are made of malleable iron with a ribbed design for added strength. The set screw has a hardened steel cup point for clamping rigidly to beam. Full thread engagement is provided by the tapping through the upper jaw. Approved by Factory Mutual Laboratories for use on fire protection and plumbing systems. Especially recommended for hanging conduit. Maximum recommended loads are from 210 to 450 pounds, for the smallest to the largest sizes, with a safety factor of 5.

Every Grinnell Malleable Iron Hanger offers . . .

- Safety factor of at least 5
- Thickness of metal increased at points of concentrated stress
- Homogenous metal composition throughout
- Extremely high resistance to impact and corrosion
- Economy



Saddle swivels, permitting suspension of the pipe or conduit at any angle in a plane parallel to the face of the supporting flange.

GRINNELL
AMERICA'S #1 SUPPLIER OF PIPE HANGERS AND SUPPLIES

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pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco air conditioning systems

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GILLETTE SAFETY RAZOR CO.
BOSTON, MASSACHUSETTS

as at Gillette begins with

At the headquarters of the world's leading manufacturer of shaving equipment, nine OTIS Freight Elevators play an important part in the factory operation. GILLETTE's primary interest is in keeping them operating at peak efficiency at all times. The material they move is vital to a continuous production set-up.

GILLETTE's engineering department also likes the idea of having all expenses known in advance. It permits easy budgeting on a monthly basis. There's never the annoyance of unexpected or costly repair bills that have to be added to shutdown costs. It is this double freedom from costly repairs and shutdowns that has kept GILLETTE sold on OTIS Maintenance through the local OTIS office for fifteen years.

Trouble-free freight elevator service starts with a FREE Otis Maintenance Survey and Estimate. Our approach is illustrated at the right.

Only OTIS Maintenance offers "engineered service" by the maker that maintains and assures peak performance at all times. Original or improved replacement parts are always available regardless of the age of the installation. All parts are replaced in advance of their breakdown point to maintain the maker's high standard of safety.

Your local OTIS office will gladly make a FREE Maintenance Survey and Estimate for you.

Otis **freight elevator**

"ENGINEERED SERVICE BY THE MAKER"

OTIS ELEVATOR COMPANY • 260 ELEVENTH AVENUE • NEW YORK 1, N.Y.

trouble-free elevator service
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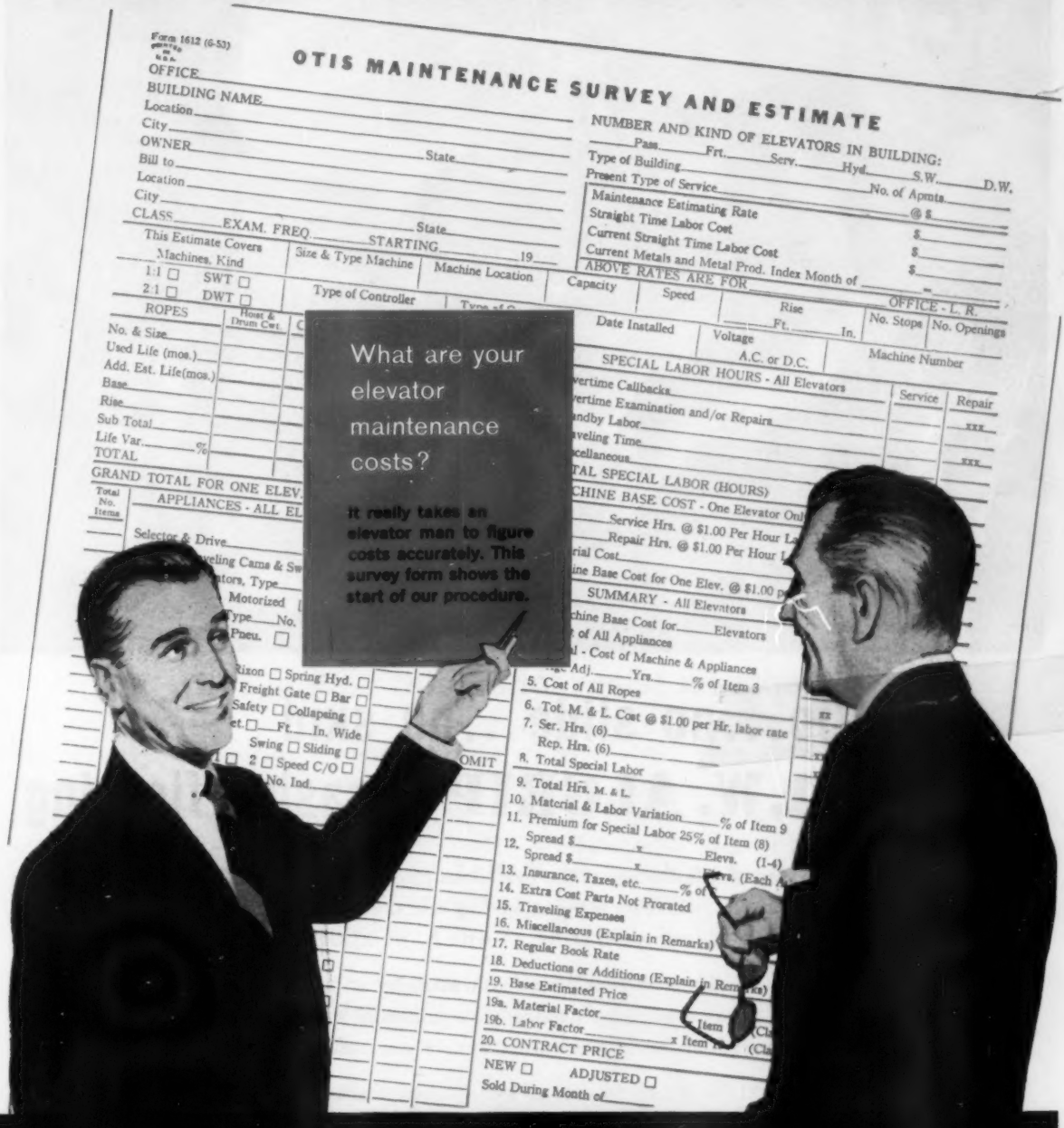
OTIS MAINTENANCE SURVEY AND ESTIMATE
What are your elevator maintenance costs?
it really takes an elevator man to figure costs accurately. This survey form shows the start of our procedure.

maintenance

"that keeps freight elevators running like new"

OFFICES IN 297 CITIES ACROSS THE UNITED STATES AND CANADA

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no slip...no slide...no skid ...with A.W. ALGRIP abrasive flooring

Be sure of safe footing at the hazardous places in your plant. You know where they are . . . wherever slipping, sliding and skidding occur. Now your slippery spots can be your safest spots . . . with A. W. ALGRIP flooring.

Here's a rolled steel floor plate that's made by an Alan Wood patented process in which an abrasive is embedded to a controlled depth . . . becoming an integral part of the steel plate, to give you lasting safety.

A. W. ALGRIP can be used as independent flooring . . . or as flooring overlay. Put your plant on a safe footing, with A. W. ALGRIP . . . Approved for Safety by Underwriters' Laboratories. Write for Bulletin ALN4

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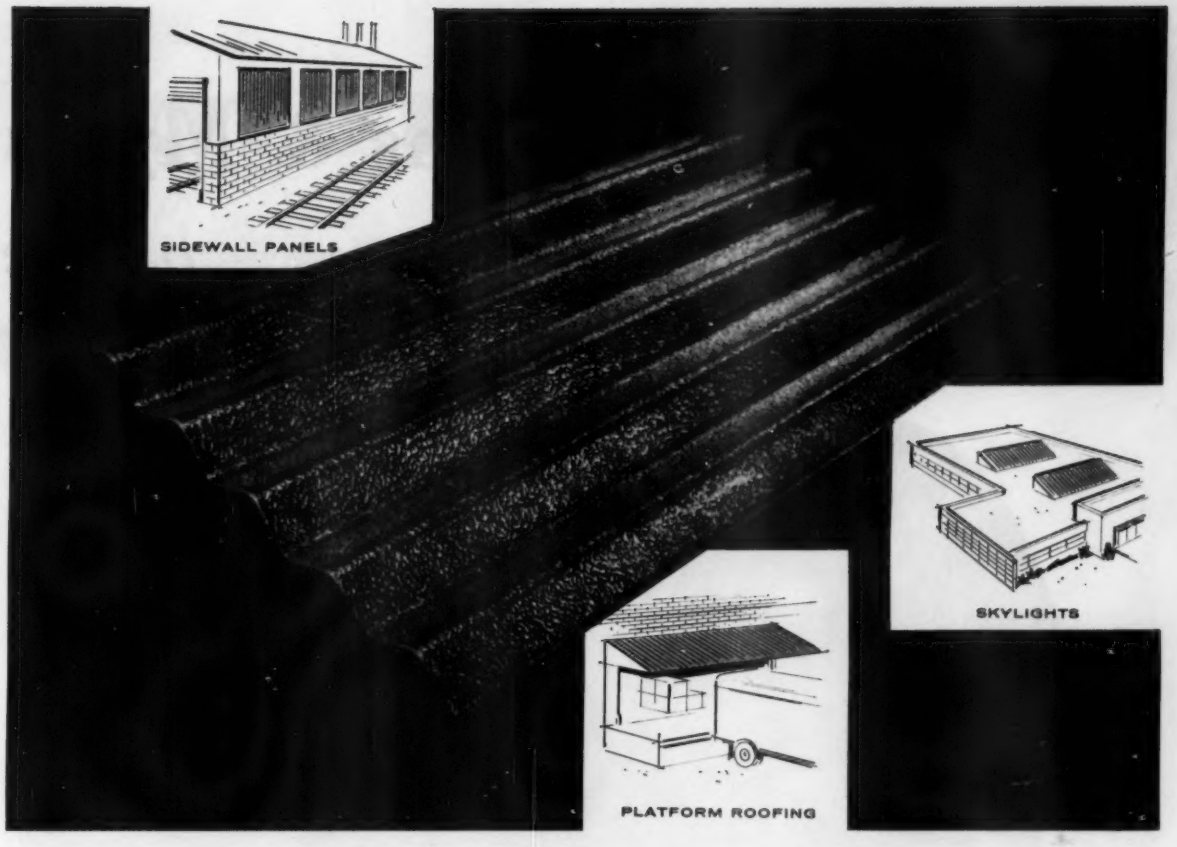
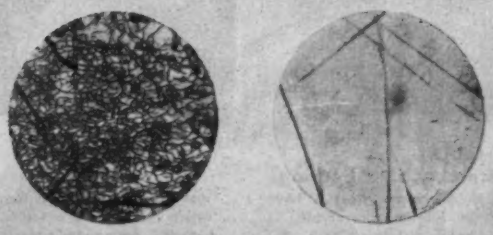


What makes this panel resist weathering?

Other glass-fiber reinforced panels may look like this when new . . . but how about three years later? The answer is in the photomicrographs below. After 36 months of continuous outdoor exposure in Florida, the panel made with acrylic-modified PARAPLEX P-444 polyester resin shows virtually no discoloration or fiber evidence. However, the panel made with conventional light-stabilized resin shows pronounced degradation.

Take advantage of the colorful and attractive appearance, high strength, good light transmission and easy installation of reinforced plastic panels in many locations around your plant. And when you do...insist on the weather-resistance of panels made with PARAPLEX P-444. Write for names of panel manufacturers.

36-MONTH FLORIDA EXPOSURE TEST



Conventional light-stabilized resin — PARAPLEX P-444

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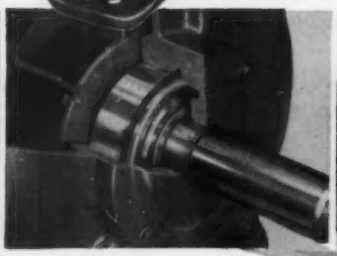
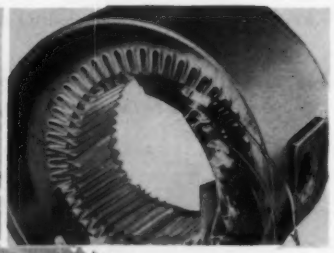




Highly efficient dual-sweep ventilation

Tandem fans, one pushing and one pulling, cool motor from end to end . . . air-wash field coil ends . . . eliminate "hot spots" . . . greatly prolong motor life!

Fully sealed prelubricated bearings

Run in double-width races . . . have extra-large lubricant reservoirs . . . seldom need re-lubrication . . . are quickly, easily inspected by removing cover plates!

Life-prolonging *Mylar insulation

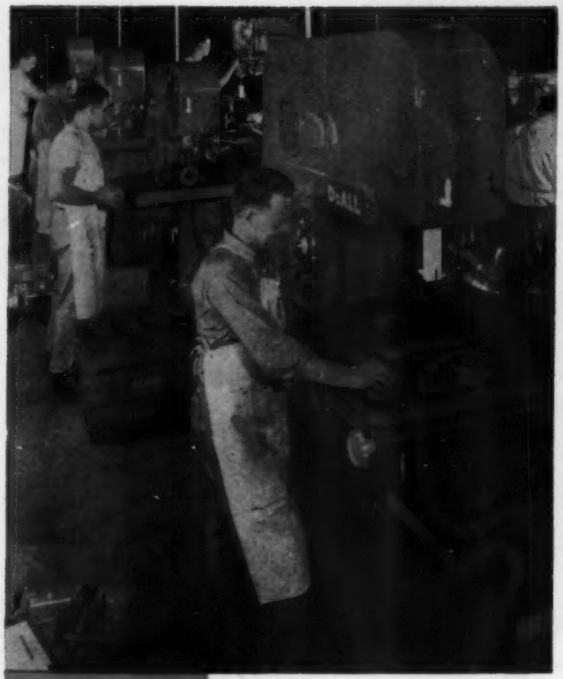
Has excellent dielectric qualities . . . resists tearing and aging . . . assures virtually permanent protection. Rag paper backing cushions against abrasions and punctures!

* DuPont registered trademark

MOTOR STAMINA

DoALL *machines*

saw their way to success!



DoALL Contour-matic Band Machine

The DoALL Company equips its versatile Power Saws and Contour-matic Band Machines with sturdy, dependable R&M motors. These motors are precision-built, with ample reserve power that helps DoALL achieve record-breaking cutting rates while working at greater feed and speed pressures.

In thousands of DoALL-equipped plants, R&M motor stamina has proven itself. R&M motors take toughest DoALL jobs in stride—powering their new Demon high-speed steel cutting tool in the machining of harder-to-cut tough new alloys. DoALL versatility depends on reliable power to saw, file, grind or polish all materials. The same strong R&M motor also drives the machine's hydraulic and air pumps, providing smooth power for automatic stock feeding, work table positioning, etc.

If your product requires heavy duty motors designed for faster, more versatile production, plus top dependability, Robbins & Myers can help you.

Contact your R&M representative or write today for Bulletin 520-PE

ROBBINS & MYERS, INC.

SPRINGFIELD, OHIO / BRANTFORD, ONTARIO

R&M builds motors from 1/200 to 200 horsepower

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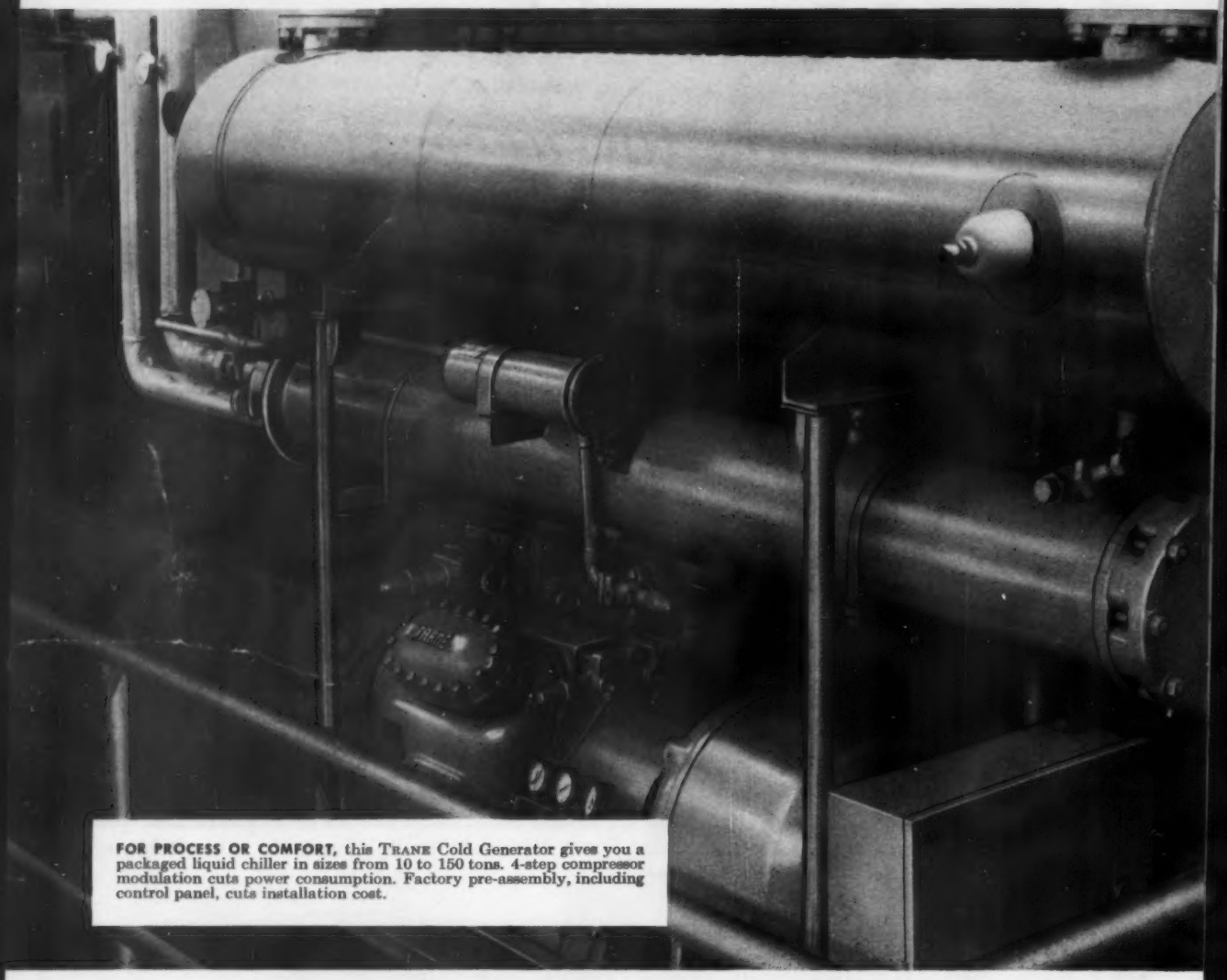
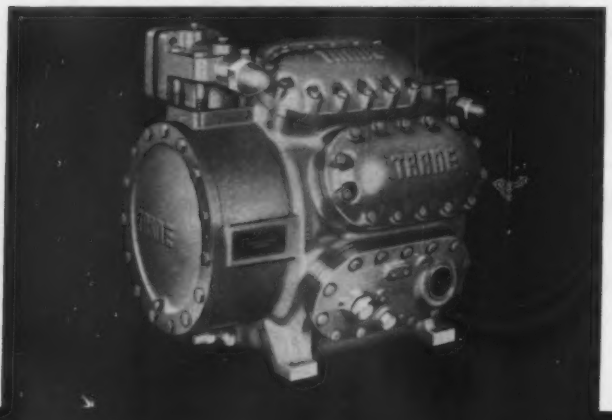
cooling costs with

Cut your industrial
the improved Trane

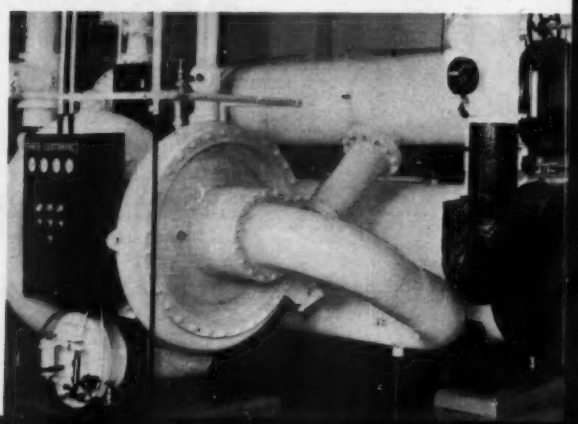


FOR PROCESS OR COMFORT, this TRANE Cold Generator gives you a packaged liquid chiller in sizes from 10 to 150 tons. 4-step compressor modulation cuts power consumption. Factory pre-assembly, including control panel, cuts installation cost.

NEW! Completely redesigned compressor is the heart of the TRANE Cold Generator. Designed for use with either R-22 or R-12 refrigerant, unit features simplified construction, with fewer moving parts; dynamically balanced for smooth, quiet operation; less starting and stopping cuts power costs, adds years to life.



FOR LARGER REFRIGERATION JOBS, this famous TRANE CenTraVac is now available in electric or steam driven models, open or hermetic design. All models modulate to 10% of capacity—or lower—with power savings in almost direct proportion to load.



cooling costs with Cold Generator

New compressor design assures smoother operation, increased dependability, longer life, easier servicing!

Now the TRANE Cold Generator liquid chiller is better than ever! A newly designed compressor—made for use with either R-22 or R-12 refrigerant—will cut your industrial cooling and air conditioning costs by providing years of dependable, trouble-free service. As the compressor is the heart of any water chiller, these improvements in the TRANE Compressor are important to any type of Cold Generator installation—process or comfort.

Check these Cold Generator Features

FACTORY-ASSEMBLED. A complete, packaged refrigeration unit designed to meet chilled liquid needs for almost all process or comfort jobs.

ECONOMICAL. 4-step compressor modulation cuts power consumption. Unit is complete—no further engineering, selecting or buying of parts is necessary. Once simple plumbing and electrical connections have been made, the Cold Generator is ready to serve any air conditioning system.

EASY TO INSTALL. Unit is factory-engineered, factory-assembled, factory-tested. No refrigeration piping is required. Ruggedly built . . . no special mounting base needed.

EASY TO MAINTAIN. New compressor (see below) has every part easily accessible for checking and service. And new lubrication system assures longer life, smoother operation.

VERSATILE. The TRANE Cold Generator is widely used for industrial process applications such as cooling dough, cooling rubber, cooling and maintaining constant temperature in electro-plating bath tanks.

For complete facts on the TRANE Cold Generator and other refrigeration equipment, call your nearby TRANE Sales Office. Or write TRANE, La Crosse, Wisconsin.

For any air condition, turn to

TRANE

MANUFACTURING ENGINEERS OF
AIR CONDITIONING, HEATING, VENTILATING
AND HEAT TRANSFER EQUIPMENT

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• 97 U.S. AND 18 CANADIAN OFFICES

TO COOL SMALLER AREAS, install a TRANE Self-Contained Air Conditioner. Commercial size unit (illustrated) available in 10, 15, 20, 25 and 30-ton capacities. De luxe units in 3, 5, 7, 10 and 15-ton sizes. All available with air or water condensing. Exclusive design features assure extra-quiet operation.

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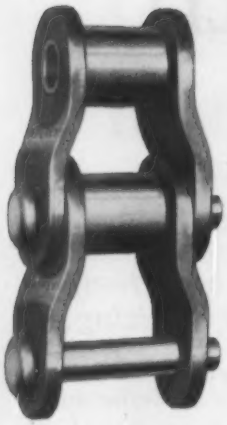


Steel Thimble Roller Chain—If you are driving a mixing drum or other equipment at an inclined angle, you can cut wear on chain drive by using this Jeffrey "offset" STR type.

Don't let work-horse appearance fool you . . . chain is a *precision* product. Its tensile strength, fatigue limit and resistance to wear affect the performance and life of *the equipment you make.*

Jeffrey chain is engineered to provide maximum strength with minimum weight, but with ample reserve strength to withstand sudden and heavy overloads.

Jeffrey chain makes good products better!

STR Hollow Pin Chain conveys bread through bakery ovens on smooth-running rollers. Conveniently spaced hollow pins provide an easy method for attaching trays or other fixtures.

Jeffrey engineers will help you design for most efficient use of power and longer lasting power transmission and conveying assemblies.

Here are some of the many types of equipment for which Jeffrey chain has been specified:

- Bakery equipment
- Bottling machinery
- Chemical processing
- Coal washers and jigs
- Conveying, loading, unloading and piling machinery
- Concrete mixers and pavers
- Cranes and shovels
- Earth and rock drilling units
- Elevating graders
- Excavators and trenchers
- Farm machinery
- Food machinery
- Glass batching
- Ice making units
- Industrial ovens
- Lumber and sawmill machinery
- Mining machines
- Pickling and plating machines
- Portable gravel plants
- Refuse collection trucks
- Road rollers
- Steel mill machinery
- Units for washing and drying materials

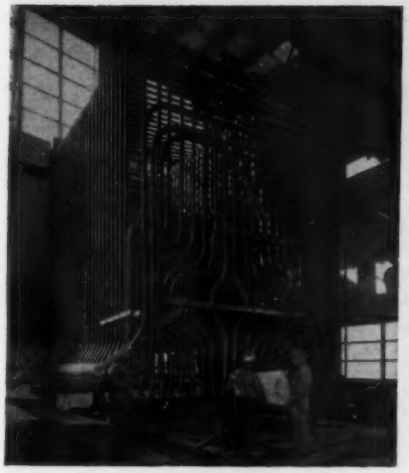
Steel Knuckle Chain—Movable packer plate inside this cylindrical refuse truck is operated by using Jeffrey chain as a tension element and driving chain from the truck power takeoff.

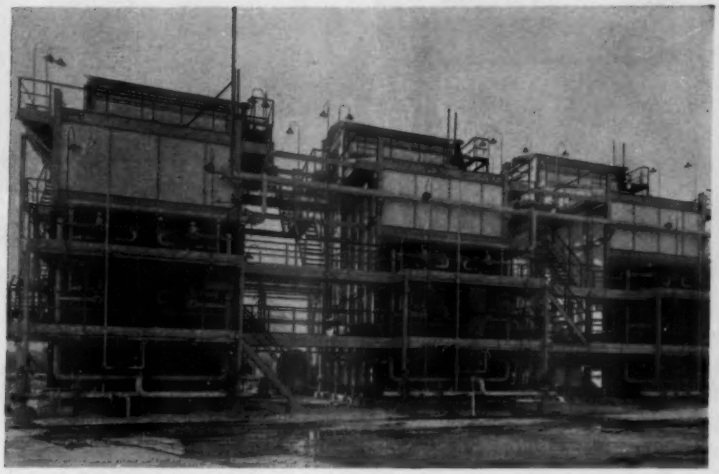
The Jeffrey Manufacturing Company,
853 North Fourth St., Columbus 16, Ohio.

CONVEYING • PROCESSING • MINING EQUIPMENT...
TRANSMISSION MACHINERY...CONTRACT MANUFACTURING

JEFFREY

For more facts circle 511 on Reply Card





AT LEFT: Installing a 60,000 lbs/hr unit in a brewery

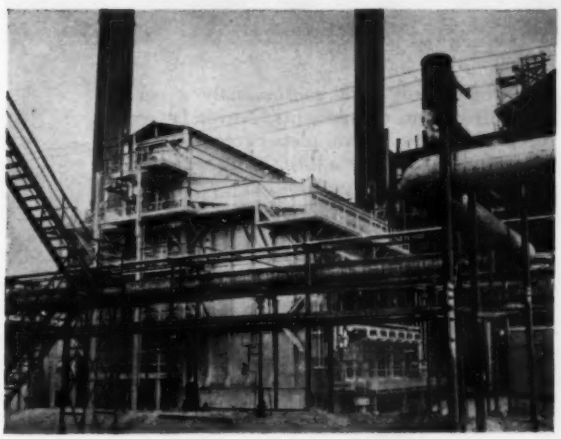
ABOVE: A battery of 125,000 lbs/hr units in a chemical plant

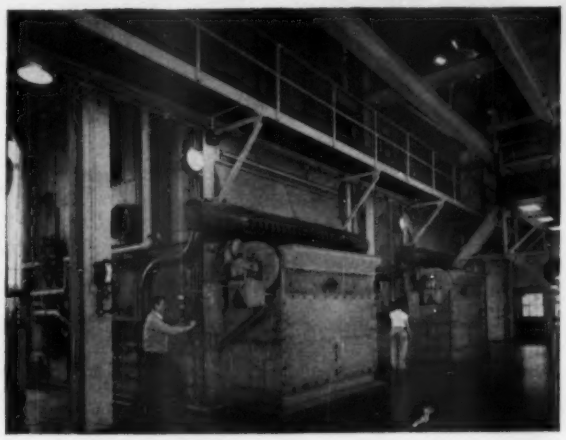
CUSTOM *Steam* GENERATORS by Vogt

Vogt engineering advances can save you money if you have a steam generating problem. Custom-built installations shown, are engineered to assure efficient, dependable steam generation for power, process and heating. Our engineering staff is available to give effective help in the solution of steam generating problems peculiar to a wide variety of operating conditions. Address Dept. 24A-BPLE.

HENRY VOGT MACHINE CO.
LOUISVILLE, KENTUCKY

SALES OFFICES: New York, Chicago, Cleveland, Dallas, Camden, N. J., St. Louis, Charleston, W. Va., Cincinnati





This 400,000 lbs/hr unit is installed in a leading petroleum refinery

Three 40,000 lbs/hr units serve a medical center

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NEW FROM HONEYWELL!

THE "COMPLETE SAFETY" PROTECTOGLO*

FIRST AND ONLY

COMPLETELY

FAIL-SAFE

FLAME SAFEGUARD

Listed and approved by the Associated Factory Mutual Laboratories and by Underwriters' Laboratories.

The need for protection in gas burner operation has been long recognized . . . and the subject of intensive research.

In 1951, a Honeywell advancement provided a "self-checking" operation at the time of burner startup . . . and spurred the search for full-time protection, because flame-safeguard components can and do fail "unsafely."

Now Honeywell, first again, offers a self-checking circuit that *continuously* supervises all system components. Never before has there been such complete protection . . . *protection you can't afford to be without.* Write for Specification S1015-5.

MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa.

Honeywell

First in Control

*"*A significant technical advancement" . . . at the A.G.A. Convention, Parade of Gas Progress.*

Your PITT CHEM® Industrial Distributor provides you with INDUSTRY'S MOST COMPREHENSIVE FAMILY OF PROTECTIVE COATINGS

TARMASTIC®

A broad line of time-tested coal tar coatings (formerly "100 Series" Coatings) which provide excellent corrosion protection on metal, masonry, and concrete surfaces—above and below ground. There's a Tarmastic formulation to control virtually any corrosion condition in your plant.

TARSET®

The exclusive and patented coal tar-epoxy resin coating that has revolutionized the control of severe corrosion. Tarset provides excellent protection against petroleum crudes, hydrogen sulfide, brines, gasoline and many other corrosive agents.

Insul-Mastic®

A series of vaporseal, condensation control and insulation coatings. Special Gilsonite asphalt formulation makes Insul-Mastic coatings highly resistant to acids and alkalis, as well as to moisture penetration.

There's a real advantage, in economy and convenience, when you buy *all* of your heavy duty *cold applied* protective coatings from one source —your Pitt Chem Industrial Distributor. Another important Pitt Chem *plus* is the ready availability of experienced technical help, wherever and whenever you need it. For more information about your coating problems, contact your Pitt Chem Coatings Distributor today!

WSW-7393

COAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON • FERROMANGANESE

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ECON® DUAL-ELEMENT FUSES

INSTANTANEOUS ACTION ON SHORT CIRCUITS
The fusible links open the circuit immediately when a dangerous short develops. The multiple restricted fusing areas cause the heavier sections to drop out in metallic form completely severing the circuit.
TIMED DELAY ON MOMENTARY OR HARMLESS OVERLOADS
Exclusive Econ Alloy thermal element takes harmless overloads up to 500% . . . gives predetermined delay action to avoid unnecessary and costly fuse blows.
IT'S THE EXCLUSIVE ACTION IN ECON'S SUPER SAFETY ZONE that makes the important difference
NO INTERMEDIATE PLASTIC STAGE
When an overload exceeds the predetermined heat and time limits, Econ Alloy reacts instantaneously . . . changing directly from solid to liquid. The usual intermediate plastic stage is completely eliminated. Protecting action is fast and complete with Econ's Super Safety Zone.

with the exclusive Super Safety Zone

- STOP NEEDLESS FUSE BLOWS
- MINIMIZE COSTLY DOWNTIME
- ECON SAVES MONEY ON FUSING
- EXTRA PROTECTION AGAINST BURNOUTS

In Econ's Super Safety Zone you'll find an important difference in action . . . a money saving . . . circuit protecting action that spells lowered costs all down the line.

In this Super Safety Zone, harmless or temporary overloads are carried through an exclusive Econ Alloy Element which delays blowing to a predetermined time limit. When overloads exceed the time limit, Econ Alloy breaks the circuit with fast action. This Super Safety feature costs you nothing extra...Another good reason why it's always extra economy to insist on ECONOMY Fuses.

Available in knife blade or ferrule type from 0 to 600 amperes, 250 and 600 volts. Underwriters' Laboratories listed.

Write for ECON Dual-Element Catalog S-60.

it's always extra economy to call for

ECONOMY FUSES

ECONOMY FUSE AND MFG. CO.
2717 Greenview Avenue, Chicago 14, Illinois

ASK YOUR ELECTRICAL WHOLESALER FOR ECONOMY FUSES . . . THE COMPLETE FUSE LINE

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NEW! LINK-BELT shaft-mounted speed reducers

The ultimate in ease of purchasing, of mounting, of maintenance

No other shaft-mounted unit can equal the combination of convenience, dependability and precision provided by the new Link-Belt shaft-mounted speed reducer.

Installation is easy . . . requires no special tools. Motor and drive can be positioned to meet practically any space and application need. Tie-rod turnbuckle permits fast, sure belt tensioning . . . leakproof lubrication assures long-lasting service. In addition, Link-Belt simplifies purchasing and selection by offering pre-selected recommendations over a broad range of mechanical power transmission requirements . . . plus "off-the-shelf" availability.

For full facts on industry's newest shaft-mounted speed reducers, contact your nearest Link-Belt office or authorized stock-carrying distributor. Ask for Book 2618.

DESIGNED TO SIMPLIFY AND SATISFY THE MAJORITY OF SPEED REDUCTION JOBS, Link-Belt shaft-mounted speed reducers are made in single and double reductions up to 40 hp. Wherever they're used, they maintain lasting efficiency with such features as hardened precision gearing, live-action lubrication, long-life ball bearings and cast iron two-piece housing. Overload release device can be furnished as original equipment or applied in the field.

Send for your copy of Shaft-Mounted Speed Reducer Book 2618 today.

LINK-BELT

SPEED REDUCERS

14,847

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office, New York 7; Australia, Marrickville (Sydney); Brazil, Sao Paulo; Canada, Scarboro (Toronto 13); South Africa, Springs. Representatives Throughout the World.

For more facts circle 516 on Reply Card

PUROLATOR FILTERS FOR THE PROTECTION OF HYDRAULIC CIRCUITS

G-200M Aircraft Restrictor Filter two-way for hydraulic oil systems metal element

PR 301 ½ GPM line type hydraulic oil filter Micronic element

PR 382 3 CFM in-line vent type Micronic element

G 200 series in-line two-way restrictor filter Metal element, internal connections

PR 312 12 GPM line type filter Micronic element

PR 412-8 12 GPM line type filter Military approval

G-187 3 GPM in-line hydraulic oil filter Metal element

P 32-28 Low pressure, high flow hydraulic oil filter

Effective filtration is essential for optimum performance in hydraulic circuits. To keep a system clean and functioning properly, it is important that the filter be designed specifically to meet the requirements of the job.

Purolator's complete line of filters for hydraulic systems includes models for every set of operating conditions likely to be encountered. A few are shown here; there are many more standard models from which to choose. If your application requires a special filter, Purolator will design and build it. Let Purolator work on your toughest filtration problem.

Filtration For Every Known Fluid

PUROLATOR

PRODUCTS, INC.

Rahway, New Jersey and Toronto, Ontario, Canada

For more facts circle 517 on Reply Card

BULLETINS just released and of immediate plant interest

CONSTRUCTION AND MAINTENANCE

101 Protected Roofing, Siding—Advantages of Color Galbestos roofing and siding are outlined in 12-pp Bulletin R-28-59a, illustrated in color. Shows how this metal roofing and siding is made, illustrates colors and corrugations available. Includes installation photos, diagrams, specifications and drawings of structural details. H. H. Robertson Co.

102 Laminated Wood—Use of laminated wood in a variety of structures is illustrated in color in this 16-pp booklet. Stresses ease of fabricating, architectural versatility, beauty and other advantages of glued laminated wood. Includes detailed specifications guide. Woodlam, Inc.

103 Aluminum for Architecture—Design information on architectural applications of aluminum is presented in this 12-pp booklet. Gives properties of architectural aluminum alloys and their use in both standard and basic mill products as building components and materials. Shows varieties of finishes available with alumimum, tells how they are obtained. Olin Mathieson Chemical Corp.

104 Aluminum Entrances—This 16-pp catalog includes illustrations and sectional views of flush panel, narrow stile, wide stile and center panel doors and entrance frames, special framing sections, sliding doors and specialty custom products. Specifications and dimensional data are included. The Alumiline Corp.

105 Acoustical Products—In this 8-pp 1959 catalog of acoustical materials are presented: Styltone, a non-combustible fissured mineral tile; Panatone, a non-combustible perforated metal pan acoustical system; Claritone, a perforated cellulose fiber tile; and perforated asbestos board. Physical and acoustical characteristics are given including flame resistance, light reflectance. Baldwin-Hill Co.

106 Machine-Applied Fireproofing—Technical information, including specifications, UL fire retardent ratings, application data and job-in-process illustrations, is provided in Bulletin F-10 on Blaze-Shield. This product is a blend of mineral fiber and inorganic binders designed for direct, machine application to structural steel cellular floors. Columbia Acoustics and Fireproofing

107 Watertight Concrete—A summary of authoritative thought on design and specification of watertight concrete is given in 6-pp folder. Covers basic requirements and tells how Pozzolith reduces permeability, shrinkage, bleeding and segregation to produce strong, durable structural concrete resistant to water penetration under normal conditions. The Master Builders Co.

108 Zinc Coating—Described in this bulletin are properties and advantages of Dimetcote 3, an inorganic zinc coating which "cold galvanizes" any steel surface. Typical applications are illustrated and general, physical and chemical properties listed. Amercoat Corp.

109 Masonry Fasteners—Catalog 158, is a 44-pp pocket-size booklet describing masonry and hollow wall fasteners, pole line hardware and masonry drills. Fully illustrated, it provides specifications, packaging information, dealer prices. Includes installation hints for new additions to the line—the DHD hammer drive masonry anchors, Wing Ding wall screw anchors and gun, others. Diamond Expansion Bolt Co.

VALVES, PIPING, FITTINGS

111 Corrosion-Resistant Valves—Eight-pp Bulletin 11 describes stainless steel valves with replaceable Teflon discs or seats for corrosive services. Illustrates globe, Y, check, needle and plug gate designs, as well as some with complete jacketing. Specification data and applicable information is included. Alloy Steel Products Co., Inc.

112 Blow-Off Valves—Bulletin B-435 describes unit tandem blow-off valves for boiler blow-off pressures to 665 psi, basic pressure rating 400 psi. Contains full description, operating details, and data on materials, dimensions, and advantages. Yarnall-Waring Co.

113 Solenoid Valve—Featured in 12-pp Catalog 2000 are high-pressure solenoid valves for hydraulic power systems. Included is descriptive and dimensional information, as well as diagrams and pressure drop charts for two-way and three-way valves in both a-c and d-c models. Waterman Engineering Co.

114 Diaphragm Valves—Six-pp Bulletin 115 contains suggestions to be considered when selecting valves for process piping systems. Advantages of diaphragm valves and their ability to meet pipe specifications are also covered, and typical process applications shown. Hills-McCanna

115 PVC Piping, Fittings—Catalog 10050-A features rigid polyvinyl chloride piping, fittings and valves. Lists specifications and physical properties and includes data on common chemicals that can be safely handled with the material. B. F. Goodrich Industrial Products Co.

116 Wrought Iron Pipe—Featured in this 64-pp bulletin is comprehensive information on wrought iron piping for soil, waste, vent and downspout applications. Contents are divided into nine sections, including reports of building piping surveys with photographic examples of vent corrosion, discriptions of corrosive conditions encountered in drainage services, comparative service records, typical installation and performance tables. A. M. Byers Co.

117 Self-Cleaning Strainer—Bulletin 1210B describes self-cleaning, semi-steel pipeline strainers in sizes from ¼ through 3 in., featuring high strength construction of the bodies, long tapered screen socket, perforated heavy-gage screen. Includes dimensions, weights. Sarco Co., Inc.

118 Swing Joints—Twelve-pp Catalog F-8 describes and illustrates swing joints of bronze, steel, Monel and aluminum for a wide range of industrial requirements. Discusses design advantages of the line and provides material specifications. Includes dimensional data and service instructions, also shows replacement parts. Jordan Corp. Div., OPW Corp.

119 Faucet-Stem Chart—This faucet stem identification chart contains 90 actual size stem photos and code numbers. The 22-by-34 in. chart can be mounted on a wall for shop use, or folded to pocket size for use on the job. Crest Mfg. Co., Inc.

DUST, FUME, MIST CONTROL

120 Dust Collectors—Cabinet cloth filter dust collectors are featured in this series of information bulletins. Photos illustrate internal design and typical applications of the compact, efficient collectors. Multiple rating tables, specifications and dimensional drawings included. Torit Mfg. Co.

Reader Service Cards for ordering bulletins are on pages 181-182. Be sure to include your name, job title, and company, even if you want bulletins mailed to your home address.

121 Mist Eliminators—Eight-pp Bulletin ME-9 describes recent advances in the technology of mist elimination, and contains data on mesh and grid construction as well as vapor velocity graphs. Various types of mist eliminators to suit specific applications are described. Metal Textile Corp.

122 Dust, Fume Control—A wide range of industrial dust and fume producing processes that can be successfully controlled with the properly designed cloth or glass bag-type dust collectors is covered in 24-pp Bulletin 562-D. Operating principles are illustrated and explained and applications pictured. Wheelabrator Corp.

INSTRUMENTS, CONTROLS

123 Servo System Components—Electrohydraulic servo system components are introduced in four new publications. Bulletin 36100, 8 pp,

BULLETINS

(Begins on page 21)

on electrohydraulic servo valves, illustrates and describes construction and operating principle of this plunger-less valve design. Specifications, flow curves and installation dimensions are included. Bulletin 36200 covers specifications, capabilities and operation of company's universal type amplifier. Bulletin 36300 illustrates and describes construction and specifications of preset and manual units. Bulletin 36400 presents many forms and types of amplifier and control panels for the systems. The Oilgear Co.

124 Temperature Controls — Form 1087, on pneumatic temperature controls, introduces Model RVA, a recording control, and Model IVA, an indicating control. Descriptive text stresses versatility, accuracy, other advantages of the instruments. Gives temperature ranges available, material specifications, information on accessories. The Partlow Corp.

125 Temperature Instrument—An electronic temperature-indicator monitor is described in Bulletin MSP-155. Gives operational features and specification data on the instrument and discusses switching, amplifying, off-normal alarms, power supply and basis design parameters, Kybernetes Div., Hagan Chemicals Controls, Inc.

126 For Difficult Fluids—Bulletin 19A presents metal tube rotameters for measuring rate of flow of hazardous and high pressure fluids at temperatures to 400 F. Provides simplified, instructions for sizing rotameters for liquid service. Tables give dimensions, capacities. Sectional drawings explain operation. Schutte and Koerting Co.

127 Precision Gages—Catalog DH-65, 36 pp, presents the full line of Helicoid gages and features newly designed Safe-T-Case gages for applications in which the gage may be subjected to violent pressure pulsations or severe mechanical vibrations. Engineering information provided covers explanation of how the gages work, types of systems, adjustments, applications, specifications, and dimensions. Included is a list of recommended uses. Helicoid Gage Div., American Chain & Cable Co., Inc.

128 Force Measurement—This 20-pp booklet describes and compares modern industrial techniques for measuring force, weight, pressure, etc. Fully illustrated with sketches, charts and diagrams, booklet reviews current force measurement practices, describes advantage of electronic force measurement, and outlines principles of SR-4 bonded strain gages and their use in force measurement devices. Electronics & Instrumentation Div., Baldwin-Lima-Hamilton Corp.

129 Weighing Systems — Bulletin 582 is an 18-pp "plan-it-yourself" catalog on Way-Pac hydraulic weighing systems. It serves to facilitate application of these systems to weighing jobs and to price the installation before ordering. In addition to engineering and application data, includes price list of component parts, also questionnaire and sketch sheet. Application examples show method of selecting proper equipment. Photos and dimensioned cross-section drawings illustrate text. The A. H. Emery Co.

130 Diesel Engine Controls—Illustrated and described in 24-pp Bulletin B45-1 are controls for diesel engines. It describes temperature and pressure control systems for diesel engines, safety devices, tachometers, control motors, valves, switches, relays and related accessories. Schematic diagrams and specifications are included. Minneapolis-Honeywell Regulator Co.

MECHANICAL POWER TRANSMISSION

131 Precision Gears — High-performance, precision gears from less than 1-in. to over 200-in. diam, and with tooth-to-tooth spacing accuracies of two ten-thousandths of an inch are described in 24-pp Bulletin GEA-6430. Design features and advantages are fully detailed and performance results described. Photos and diagrams illustrate details of operation. General Electric Co.

132 Flexible Couplings — Bulletin 205, 6 pp, describes standard and special bonded rubber flexible couplings. Contains specifications for three standard shear-type couplings, 1/50 to 100 hp at 1750 rpm. Formula for selecting standard coupling for other speeds is given. Custom-engineered couplings are shown in typical installations indicating a wide range of sizes and torque capacities. Lord Mfg. Co.

133 Pillow Block, Flange Bearings —Twelve-pp Bulletin 106 describes new pillow block and flange bearings, including types for normal and light duty applications. Describes and illustrates design features, and provides dimensional and load ratings data. Hoover Ball and Bearing Co.

GENERATORS AND AUXILIARIES

134 How to Select a Boiler—Filled with illustrations and graphs, this 20-pp pocket size booklet is a guide to boiler selection. Covers such topics as first cost vs operating costs, fuel selection, construction cost savings, low headroom solutions, packaged vs built-up boilers, design standards, boiler efficiency. Cleaver-Brooks Co.

135 Steam Generator—Bulletin 582 CS describes design and operation features of company's vapor water tube steam generator which differs from conventional water tube steam generators in that initial heating and final vaporization occur in the shell, rather than in the tubes. Schematic diagram is included, as well as specifications. TXT Texsteam Corp.

Postage-free Reader Service Cards make it easy to order bulletins. Cards are provided on pages 181-182.

136 Firing Systems—Bulletin 5843 describes industrial packaged forced-draft systems for dual-fuel or single-fuel firing of high or low pressure natural, LP or manufactured gas or any grade of oil. Included are illustrations, information on typical installations. Iron Fireman Mfg. Co.

138 Fuel Burning System—Eight-pp Bulletin 1255 lists 11 sizes of oil, gas and combination gas and oil burners for firing boilers or other heat exchange equipment. Cutaways views in color show operating principles. Typical burner arrangements and some installations pictured. Orr & Sembower, Inc.

139 Burner Control Systems—Folder 5803-A describes pre-wired, panel control systems for automatic oil, gas or dual-fuel burners in industrial and other boiler installations. Included are dimensions, illustrations, selection chart for ready identification of panel assemblies. Iron Fireman Mfg. Co.

PUMPS, COMPRESSORS

140 Controlled Capacity Pumps—Catalog 100, 8 pp provides detailed description of company's Series 100 proportioning pumps. Also contains information on chemical feed pump-tank package system. Includes data on materials of construction, modifications. A quick selection chart covers simplex and duplex models. Pump Div., American Meter Co.

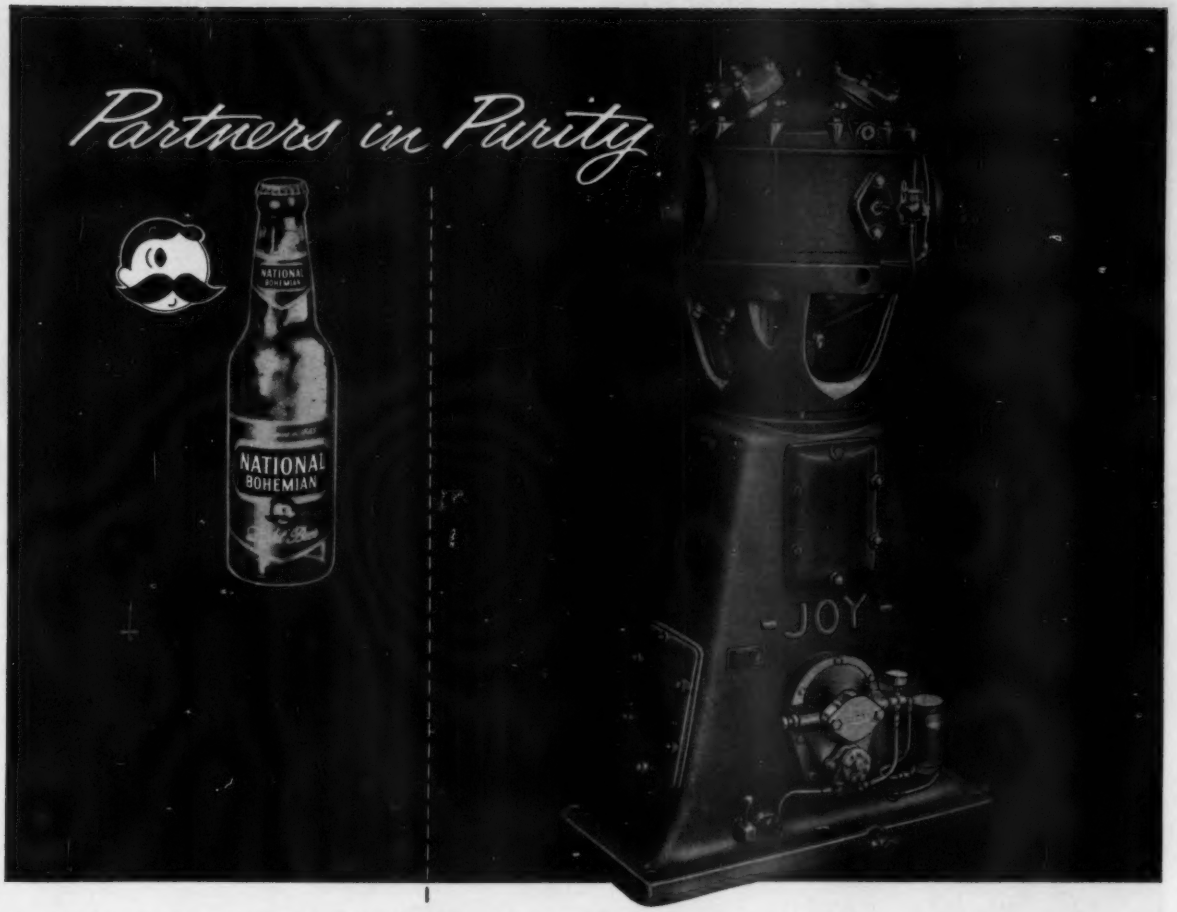
141 Ceramic Pumps—Bulletin LV-758 describes company's LV series pumps available in heads to 180 ft and capacities to 600 gpm, maximum temperature 400 F. Discusses shaft, seal assembly, impeller, other components, and includes capacity data. General Ceramics Corp.

142 Unit Air Compressors—Twelve-pp Bulletin SG-2, illustrated in color, describes G single-stage, YS single-stage and YC two-stage compressors from ½ to 15 hp, available pressures from 80 to 250 psi. Specifications list cfm displacements, pressures, weights, dimensions. Parts and accessories are discussed. A section is devoted to air receiver and storage tank. Le Roi Div., Westinghouse Air Brake Co.

FANS AND BLOWERS

143 Axial Flow Fans—Bulletin 5802 describes axial flow fans designed to provide high air displacement and pressure for cooling, heating and ventilating. Suggested applications are listed. Included is table of electric motor specifications for 27-v d-c 400- and 60- cycle a-c, and special models. Pesco Products Div., Borg-Warner Corp.

(More Bulletins on page 183)



JOY OIL-FREE COMPRESSORS HELP GUARD QUALITY OF NATIONAL BOHEMIAN BEER

Oil-free compressed air is used for other operations in the "National-Bob" plant.

The National Brewing Company, Baltimore, Md., uses oil-free compressed air to regulate an important phase of their processing. Temperature control during pasteurizing is a critical point in the brewing of fine beer. Recording instruments control the steam inlet on preheat and precool tanks. The compressed air that operates these instruments must be free of oil and water or they plug up and record incorrectly.

National Brewing hasn't had a bit of trouble with this operation since they installed their first Joy Oil-Free Compressor. These compressors use carbon piston rings that require no lubrication. No oil in the cylinder—no oil in the compressed air.

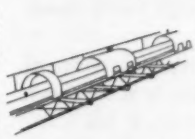
Is National Brewing happy? They placed a second Joy unit in operation a year later. Find out more about Joy oil-free compressors . . . write ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company, (Canada) Limited, Galt, Ontario.*

JOY . . . EQUIPMENT FOR INDUSTRIAL PLANTS . . . FOR ALL INDUSTRY

NEED OIL-FREE AIR . . . WRITE FOR FREE BULLETIN 167-15.

WBW 16884-167

INDUSTRIAL COMPRESSORS


CONVEYORS

ELECTRICAL CONNECTORS

FANS AND BLOWERS

For more facts circle 518 on Reply Card

Gulf makes things run better, with—

NEW GULFCROWN

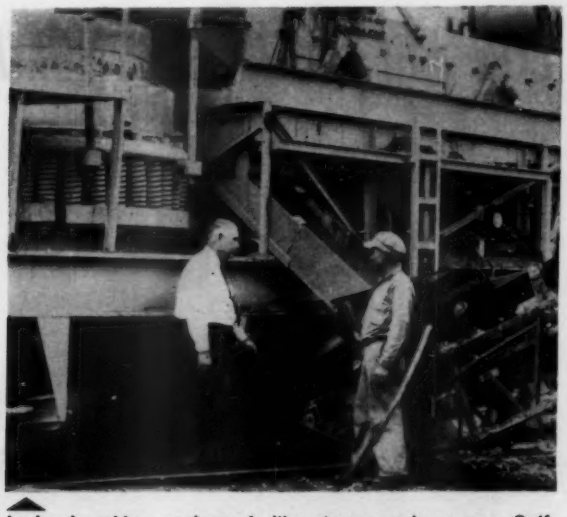
Here's a multi-purpose lithium base grease for bearings in heavy duty service.

It's a completely new bearing grease that effectively lubricates bearings operating under high loads, shock loads and with oscillating motion.

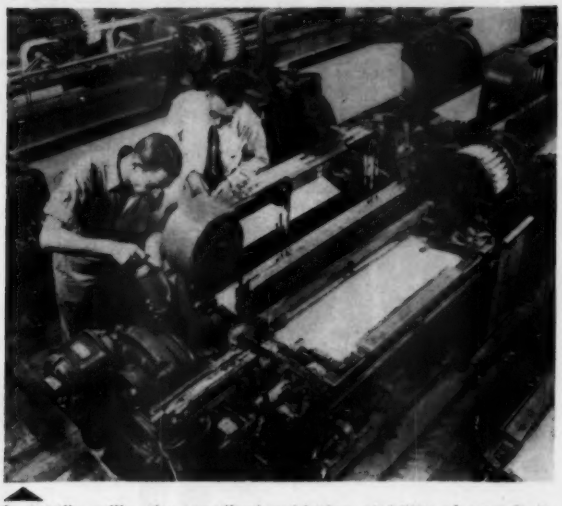
New Gulfcrown Grease E.P. will give you plenty of proof that Gulf makes things run better. It resists heat, cold, moisture and mechanical breakdown. It has excellent oxidation stability and protects against corrosion.

You'll find that this new grease pumps freely at 0°, yet stands up at temperatures to 250° F., and even higher under certain conditions.

New Gulfcrown E.P. is an unusually versatile multi-purpose grease. For example, it gives excellent results in the lubrication of heavily loaded trunnion bearings . . . steel mill work rolls and table rolls . . . sliding dog clutches . . . spiral gear boxes . . . Banbury mixers . . . the bearings, cams and gears in textile looms . . . and



In hard-working equipment, like stone crushers, new Gulfcrown Grease E.P. withstands extremely high shock loads in grease lubricated bearings.



In textile mills, the excellent oxidation stability of new Gulfcrown Grease E.P. makes it the ideal lubricant for loom bearings, cams, pick balls and gears.

In steel mills, new Gulfcrown Grease E.P. will successfully withstand the high temperatures and extreme pressures encountered in the lubrication of work rolls and table rolls.

GREASE E.P.

a host of other heavy-duty industrial applications.

Gulfcrown E.P. can be used for electric motor bearings, fans, pumps and for nearly every type of application. Can be applied through centralized systems or by gun. Available in NLGI consistencies 0, 1 and 2.

Find out how Gulfcrown E.P. can improve your operation and help you get lower maintenance costs. Call your Gulf Sales Representative at the nearest Gulf office. Meanwhile, mail coupon for new booklet.

GULF

GULF OIL CORPORATION
Dept. DM, Gulf Bldg., Pittsburgh 30, Pa.

Please send booklet on new Gulfcrown Grease E.P.

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City_____ Zone____ State_____

PE-82OP

For more facts circle 519 on Reply Card

FOR EFFICIENT, ECONOMICAL POWER DISTRIBUTION

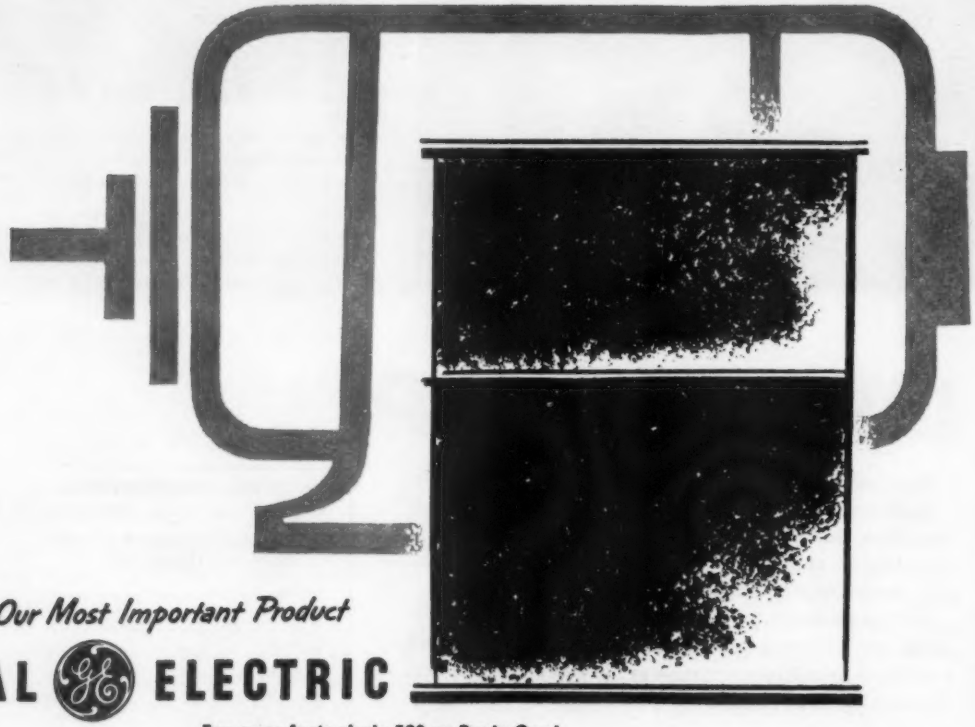
Use Capacitors With Motors

Why? Because capacitors supply the magnetizing current (kilovars) required by induction motors. This on-the-spot generation of kilovars can save you money because it reduces the current you must obtain from your utility and distribute in your plant.

Switched with motors, capacitors assure a regulated kilovar supply and free the distribution system to provide additional kilowatts. As a result, more motor, lighting and other loads may be added to the system without overloading transformers or other distribution equipment.

General Electric has a complete line of capacitors to serve the magnetizing requirements of motors. And now a new, easy-to-use selector guide is available to help you choose the right capacitors for your motors.

For your free copy of this handy capacitor guide, or for more information on G-E capacitors for industrial applications, write to: Section 446-6, General Electric Co., Schenectady, N. Y.



Progress Is Our Most Important Product

GENERAL ELECTRIC

For more facts circle 520 on Reply Card

New Engineered Maintenance procedures help Aetna Finance organize and control cleaning chores

"Now our sanitary maintenance program runs itself

...and we've saved 25 per cent on labor...15 per cent on materials ...50 per cent on supervision...10 per cent on building depreciation."

These are the actual sanitary maintenance economies reported by Aetna Finance Company after thorough testing of Puritan Chemical's new ENGINEERED MAINTENANCE system of plant and office housekeeping.

Aetna tried ENGINEERED MAINTENANCE in its new St. Louis headquarters building, using its own janitors and porters. "ENGINEERED MAINTENANCE made our work easier," says David R. Corwin, Aetna Secretary-Treasurer. "It's taken the pressure off our supervisors and janitorial crew."

Available without charge

ENGINEERED MAINTENANCE is a complete, individually planned program which any user of Puritan sanitary maintenance products may request. It applies tested systems and engineering techniques to the specific sanitary maintenance requirements of your plant. It organizes your custodians' work on an engineering basis—sets up automatic controls—provides for systematic follow-through and review.

Gives you more time

Puritan's ENGINEERED MAINTENANCE helps free you of petty sanitary maintenance details, and makes your janitors more efficient and dependable.

Even top management now is becoming more interested in efficient sanitary maintenance. It must protect its increased investment in plant, equipment and higher over-all labor costs.

Streamlines a "problem" operation

Because of the human element... relatively unskilled and unsystematic personnel...sanitary maintenance can make heavy inroads on your time. ENGINEERED MAINTENANCE helps you get the job done thoroughly and economically. It enables you to chart for management all the continuing detail involved, and to lay out a plan of operation.

No cost—and no strings

As a user of Puritan sanitary maintenance products, you can have a Program engineered to your individual needs...free.

You do not pay a premium of any kind for a Puritan ENGINEERED MAINTENANCE Program. You are not involved in any long-term contract.

Puritan products are nationally used, competitively priced, fully guaranteed. The burden of proof is upon us.

New technical brochure

Write for "ENGINEERED MAINTENANCE." This new brochure gives you the details you want. It shows you a way towards simplified and trouble-free sanitary maintenance operations in your plant.

PURITAN CHEMICAL COMPANY

EXECUTIVE OFFICES: 916 ASHBY STREET, N. W. • ATLANTA 18, GEORGIA
PLANTS: ATLANTA, GEORGIA • HOUSTON, TEXAS • ST. LOUIS, MISSOURI

For more facts circle 521 on Reply Card

Invincible draws used coolant from turret lathe into swivel-wheeled auxiliary tank. Especially designed for handling liquids in volume, tank is equipped with air diffuser, automatic shut-off and discharge valve.

INVINCIBLE VACUUM UNITS

Clean Machine Sumps Quick

Use Invincible vacuum equipment to remove the accumulated liquid, chips and dirt from machine coolant tanks and sumps. Eliminate mess—and do the job in ⅓rd the time.

At Great Lakes Manufacturing Corp., Cleveland, Ohio, the Invincible pictured services 17 major machines—turret lathes, grinders, and drill presses—plus a number of small machines.

All the maintenance man does is wheel the Invincible and auxiliary tank to each machine. He inserts the vacuum hose in the sump. Powerful vacuum draws out liquid, chips and sludge, depositing the mixture in the 55-gallon auxiliary tank. Average time per machine: 5 minutes instead of the 15 formerly required.

With Invincible, there's no need to remove highly inaccessible drain plugs . . . no need to handle messy drip pans (often 4 or 5 times per machine) . . . no need to hand-scoop slimy residue that remains after conventional draining.

And the Invincible also serves 2 to 3 hours a day as a vacuum cleaner, keeping shop, dock and office floors clean.

CHECK THE MANY USES FOR INVINCIBLES

Invincibles handle almost any material—liquid or granular—that will pass through a vacuum hose. They cost little, last for years. In 22 models from ½ to 7½ H.P.—the most complete line of heavy-duty industrial vacuum equipment. Resident engineers in all principal cities.

WRITE FOR BOOKLET . . . It tells about the many materials Invincibles reclaim or remove.

INVINCIBLE

VACUUM CLEANER MFG. CO.
DOVER, OHIO
OVER 50 YEARS THE LEADER IN INDUSTRIAL VACUUM EQUIPMENT

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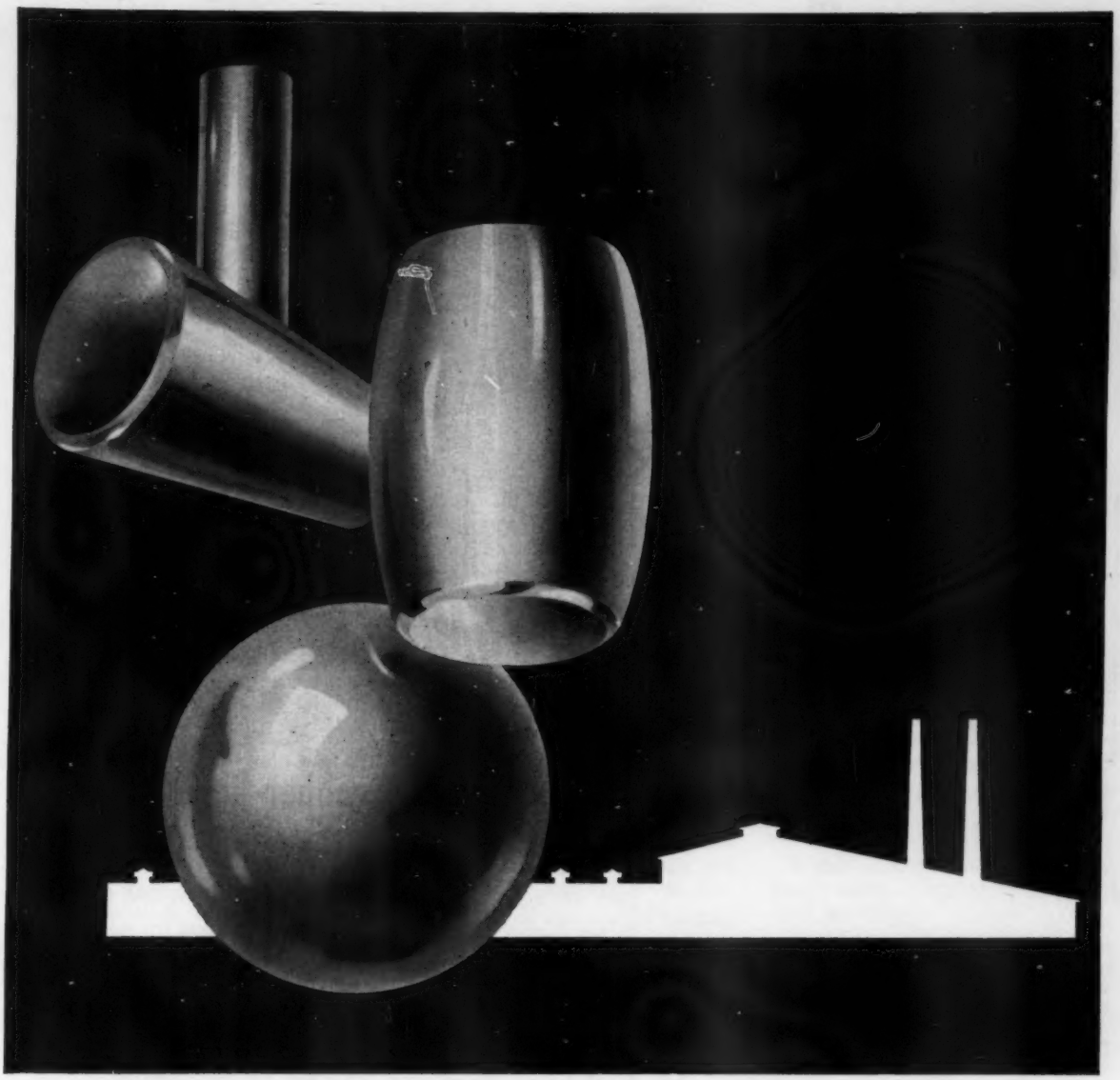


the multi-purpose grease with "special" performance

Here is one multi-purpose grease that actually performs better than a great many "special purpose" greases for all types and sizes of bearings – even under extreme *pressure*, *temperature* and *moisture* conditions.

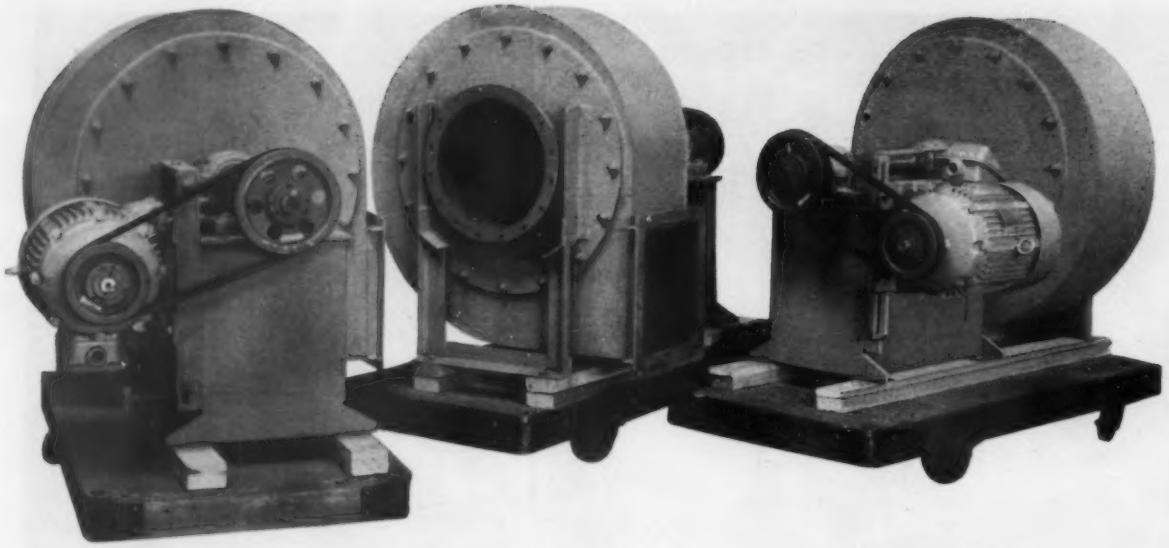
Nebula EP retains its outstanding lubricating properties at temperatures above the limits of a number of special heat-resistant greases. But unlike many high-temperature greases, Nebula EP possesses high anti-wear and load-carrying qualities – comparable to those of most specialized extreme-pressure greases. Nebula EP's *constant consistency-temperature characteristics are among its most outstanding features.* And Nebula EP's excellent oxidation stability assures long service and storage life.

Now available in three grades, Nebula EP is well suited to *all* types and sizes of bearings...can be applied by hand packing, grease cup or gun, or through a centralized system. For further information, contact your nearest Esso office in New England, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, West Virginia, the Carolinas, Tennessee, Arkansas, Louisiana, and the District of Columbia. Or write Esso Standard Oil Company, 15 West 51st Street, New York 19, N. Y.

NEBULA® EP Esso

ESSO RESEARCH works wonders with oil

For more facts circle 523 on Reply Card



EXHAUSTING CORROSIVE FUMES

no problem for Clarage rubber-lined fans

Clarage's distinctively heavy-duty construction, plus the added advantage of special coatings, add up to far longer service life. Important savings for you!

The Clarage fans above are now serving as leach tank exhausters, handling fumes from a concentrated brine solution containing up to 5% hydrochloric acid. In this case, all interior fan parts are protected by a layer of rubber vulcanized to the metal. For other extra-severe applications Clarage fans can be treated with other special coatings, lead lined, or built of special construction.

If you're seeking fans that have what it takes — in every respect — call us in. CLARAGE FAN CO., Kalamazoo, Michigan.

Send for Bulletin 702-A

CLARAGE

. . . dependable equipment for making air your servant

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • IN CANADA: Canada Fans, Ltd., 4285 Richelieu St., Montreal

For more facts circle 524 on Reply Card

Maintenance and Steam Traps

. . . there's a relationship that goes far beyond trap maintenance alone

Good traps and good trapping have a greater effect on your maintenance costs than does trap maintenance itself. By that we mean that the right traps, properly selected and installed, and with the benefits of a preventive maintenance program, will save far more maintenance dollars than they will cost.

Under the pressure of spiralling maintenance costs, this thought becomes mighty important. Let's take a look at what it involves:

Proper Selection of Steam Traps

1. Be sure it's the right type of trap.

2. Be sure it's sized right and is for the correct operating pressure.

3. Be sure it's first rate in design and construction.

Proper Installation of Steam Traps

1. Install them so they are accessible for inspection and maintenance.

2. Install a test valve.

3. Use a union or unions.

4. Use a shutoff valve or valves.

5. Use a strainer ahead of the trap if dirt conditions are bad.

6. Use a by-pass only where continuity of service is imperative.

7. Standardize inlet and outlet connections.

Preventive Maintenance Program

1. Test trap regularly for proper operation. (Trap size, operating pressure and importance determine frequency.)

2. Inspect internal mechanism at least once a year.

You Get Indirect Benefits As Well

The direct benefits of the plan outlined are pretty obvious — good traps, properly selected, require less maintenance . . . testing and inspection prevents troubles that lead to maintenance.

However, this plan provides indirect benefits which reduce maintenance in other parts of the plant as well:

Good traps save steam and reduce the load (and consequently maintenance) on fuel handling and burning equipment and on ash handling equipment.

Good traps protect the system by eliminating water hammer and preventing the damage it can do.

Good traps discharge carbon dioxide before it can go into solution to form corrosive carbonic acid —less corrosion, less maintenance.

Good traps increase production to reduce the length of time equipment must operate or reduce the amount of equipment needed . . . either way maintenance is reduced.

How to Go About It (The Sales Pitch)

We admit we're prejudiced, but we don't think there is any better way to select steam traps than with the help of the 44 page Armstrong Steam Trap Book. Here in a single source is specific data on the selection and sizing of traps, how to install them for best results, and how to maintain them most economically.

The Steam Trap Book will also give you full information on the design and construction of Armstrong Inverted Bucket Steam Traps that offer these important maintenance-reducing advantages:

1. Armstrong Traps are dependable.

2. Armstrong Traps require no adjustments — go from full load to zero load automatically.

3. Armstrong Traps are self-scrubbing—ordinary dirt conditions can't hurt them.

4. Armstrong Traps have long-life parts — valve and seat are heat treated chrome steel — lever assembly and bucket are stainless steel.

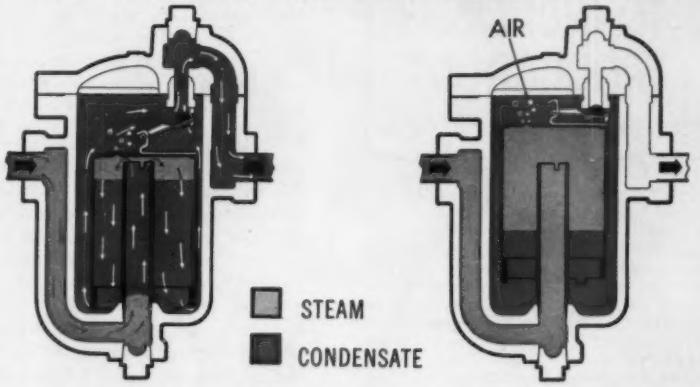
5. Armstrong Traps have water sealed valves to minimize wire drawing and erosion.

Ask for your copy of the Steam Trap Book—there is no obligation. Then test Armstrong Trapping. If you are not completely satisfied with the results, you can return the traps for a full refund of the purchase price. You can't lose much that way. Call your local Armstrong Representative or Distributor, or write

Armstrong Machine Works
9122 Maple Street
Three Rivers, Michigan

ARMSTRONG STEAM TRAPS

HERE'S THE STEAM TRAP DESIGN THAT CAN REDUCE YOUR MAINTENANCE PROBLEMS



Trap open. Condensate entering trap has caused bucket to lose buoyancy. Weight of bucket times leverage pulls valve open. Air is discharged along with condensate.

Trap closed. Steam has floated inverted bucket; valve is held tightly closed by system pressure. Air entering trap passes through bucket vent and accumulates at top of trap.

For more facts circle 525 on Reply Card

"THIS LUBRICANT ENABLED US TO INCREASE PRODUCTION"

says—PITTSBURGH TUBE COMPANY

"Our 70,000 pound Draw Bench was designed to operate at a maximum of 80 feet per minute, full load. We decided to increase the drawing speed on lighter tubing to 100 and 104 feet per minute. This overloaded the Speed Reducer, however, causing it to overheat. We tried four different makes of oils without success before trying LUBRIPLATE A.P.G. 90. With LUBRIPLATE, we are able to pull heavier tubing than before at 104 feet per minute without the Reducer overheating."

R. S. Vorous
Maintenance Engineer

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE GREASE AND FLUID TYPE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.

LUBRIPLATE is available in grease and fluid densities for every purpose . . . LUBRIPLATE H. D. S. MOTOR OIL meets today's exacting requirements for gasoline and diesel engines.

For nearest LUBRIPLATE distributor see Classified Telephone Directory. Send for free "LUBRIPLATE DATA BOOK" . . . a valuable treatise on lubrication. Write LUBRIPLATE DIVISION, Fiske Brothers Refining Co., Newark 5, N. J. or Toledo 5, Ohio.

For more facts circle 526 on Reply Card

BACKTALK AND FORETHOUGHTS

Edited by Marjorie E. Weissman

Pipeline Color Codes

PLANT ENGINEERING:

"I would like to color code the electrical, air, steam, water, etc. lines in my plant. Would you please send me any information regarding standardization for color coding for these lines." *John E. Korbett, Senior Methods Engineer, Economic Machinery Co., Worcester, Mass.*

► Because we no longer have tear sheets of an article we published on this subject in 1954, we suggest that readers interested in more information on color coding pipelines write to The American Society of Mechanical Engineers, Publications Section, 29 West 39th St., New York 18, N.Y. and ask for a copy of "Scheme for Identification of Piping Systems A13.1." The cost of this standard is $1.00 and covers all systems with exception of electrical.—*Editors.*

Acid Resistant Floor Coating

PLANT ENGINEERING:

"In your November, 1955 issue of your magazine, PLANT ENGINEERING, you had an article entitled 'Acid Attacks Stymied—Coating Protects Plant Floor and Wall.'

"We are very much interested to know the name of the manufacturer of this particular material. Any information you can give us would be greatly appreciated." *Harry Gellin, President, The Gelling Co., Cleveland, Ohio.*

► The manufacturer of the protective coating mentioned in our article is Jameson Chemical Corp., 154 East Erie St., Chicago, Ill.—*Editors.*

Compressors—Rotary or Reciprocating?

PLANT ENGINEERING:

"Your article 'Duplex Compressor Layout Saves Space, Reduces Number of Motors and Control' in the December, 1958 issue, is of considerable interest to us. We would appreciate further information if possible, mainly with regard to the maintenance experience and personal opinion of the plant air supply as compared with the use of reciprocating machines. We wonder also whether any type of oil separation is necessary in an installation of this type wherein the air is used for tools, pneumatic systems, or air operated control systems.

"In closing, we would like to express our appreciation of your excellent series of articles on construction specifications. May we have the tear sheets of Part V dealing with progress reports on final inspection?" *Richard R. Reinheimer, Plant Facilities Engineer, Stratos Div. Fairchild Engine and Airplane Corp., Bay Shore, L. I., N. Y.*

► This inquiry has been forwarded to Edward F. Menerth, Jr., O. S. Tyson and Co., Inc., 230 Park Ave., New York, 17, N. Y., who will be able to put our reader in touch with the plant engineer responsible for the installation.—*Editors.*

Annual Index

PLANT ENGINEERING:

"I notice in the 'Backtalk and Forethoughts' section of your October, 1958 edition of PLANT ENGINEERING that annual indexes are available for this journal. We would appreciate indexes for 1958, 1957, 1956 and 1955." *J. B. Finstad, Engineering Dept., The Steel Company of Canada, Ltd., Hamilton, Ont., Canada.*

► Copies of the annual index for each of the years requested by Mr. Finstad have been sent to him with the compliments of the editorial department.—*Editors.*

Construction Specifications

PLANT ENGINEERING:

"Please send a copy of section A, 'General Conditions,' applicable to contracts.

"We would also like to take this opportunity to thank you for the complete and concise manner in which the material in PLANT ENGINEERING is presented. Your broad selection of subjects has made your magazine one of the most interesting in the industrial field." *Glenn R. Ekers, Office Engineer, Erie Railroad Co., Cleveland, Ohio.*

PLANT ENGINEERING:

"Please send us the free literature and information of the 16-page copy of section A, 'General Conditions,' and the other reproductions of certain bulletins as offered in your recent issues of PLANT ENGINEERING magazine.

"We have been reading this information as you have been publishing it with great interest, and have found the articles very profitable and inform-

wherever your plant operating plans include water . . .

BETZ

CONSULTANTS ON INDUSTRIAL WATER PROBLEMS

BETZ LABORATORIES INC., Philadelphia 24, Pa.

MOUNTING GLAND
Eliminated ON
CHEMPRO
"Wedge-Lock"
mechanical seals

The Chempro line of external "wedge-lock" seals does not require a mounting gland, or any modification to the stuffing box, to align and hold the Chempro seal in position. The patented "wedge-lock" design automatically seats the seal stator in the stuffing box in perfect face-to-face alignment with the seal rotor on the shaft. Simple and easy to install—*in only 20-30 minutes.*

OTHER ADVANTAGES

- Completely Interchangeable with Packing
- Simple in Design—Only 8 Parts
- Chempro Teflon* Shaft Packing—Chemically Inert
- External Seals Adjustable After Installation
- Parts Interchangeable Between Seal Styles
- External and Internal Seals Available—From Vacuum to 100 psi

*du Pont trademark

Write for Bulletins CP551 and 575

CHEMICAL & POWER PRODUCTS, Inc.

7 Broadway, New York 4, N. Y.

For more facts circle 528 on Reply Card

BACKTALK— FORETHOUGHTS

ative." *M. H. Larson, Manager, Watchtower Bible and Tract Society of New York, Inc., New York.*

PLANT ENGINEERING:

"In accordance with your offer in the December issue of PLANT ENGINEERING, we will appreciate receiving a copy of section A, 'General Conditions,' and the reproductions of the several bulletins pertaining to the excellent article on construction specifications.

"You are to be commended for publishing such extremely practical material as this five-part series of articles by Mr. R. E. Wallin." *F. W. Bremmer, Vice President, Engineering, The National Supply Co., Pittsburgh, Pa.*

PLANT ENGINEERING:

"I would appreciate receiving a copy of section A, 'General Conditions,' as indicated by your very thoughtful offer in the December issue of PLANT ENGINEERING.

"This is a most valuable service you are furnishing to your readers." *Ralston H. Miller, Chief Draftsman, LaPierre, Litchfield & Partners, Architects, New York, N.Y.*

Formulas Not Enough

PLANT ENGINEERING:

"As usual the November issue of PLANT ENGINEERING contained a profusion of timely and informative articles. No exception to this was the one concerning maintenance stores control procedures, page 90, and a formula and chart for determining economical ordering quantities. I was somewhat disturbed however by two implications in Mr. Mostyn's article.

"The first of these was the suggestion that the formula used to determine economical ordering quantities was an original one, which is far from the actual situation. This particular formula is credited in Production Handbook (Ronald Press) to a Mr. Camp, who apparently derived it about 1922 primarily for manufacturing lot sizes. Many others have been put forth for both manufacturing and purchasing lot sizes.

"The second point which I feel did not receive enough emphasis is that any formula for economical lot sizes is based upon empirical data, so that answers obtained must be subjected to good purchasing acumen. A range of ordering quantities is often indicated where little difference occurs between the computed optimum quantity and the two or more bracketing quantities.

"Even the results for 10-cent items in the Mostyn article suggest that only a one per cent differential would occur if 350 or 450 were purchased instead of the 400 computed from the formula. In fact, there should be strong suspicion as to the need for a close control of this type over such a low-cost item. Perhaps a simple visual stock control would suffice.

"Another feature also commonly ignored in determining economical lot sizes is possibility of obtaining quantity discounts for larger orders. Therefore, if a $10.00 unit cost were anticipated to a quantity of 0-40 per order, while a $7.00 figure could be expected for 50 and over, the logical action would be to buy at least 50 according to the method shown in the article.

"While formulas are basically sound for developing raw data in industrial operations, substantial further thought is inevitably required for accurate analysis and application of that data from a practical standpoint." *R. D. Courtright, Registered Professional Engineer, Poughkeepsie, N. Y.*

Uses for Abrasive Cutting

PLANT ENGINEERING:

"We note an article 'Cutting with Abrasives,' on page 100 in PLANT ENGINEERING's December, 1958 issue. In the lower right hand corner of page 101 is a picture depicting an abrasive wheel being used to remove tubes from a tube bundle.

"We are interested in this application and would appreciate details with particular stress being placed on safety of this installation." *V. K. Brandenburg, Sup't. Refining Dept., The Texas Co., Westville, N.J.*

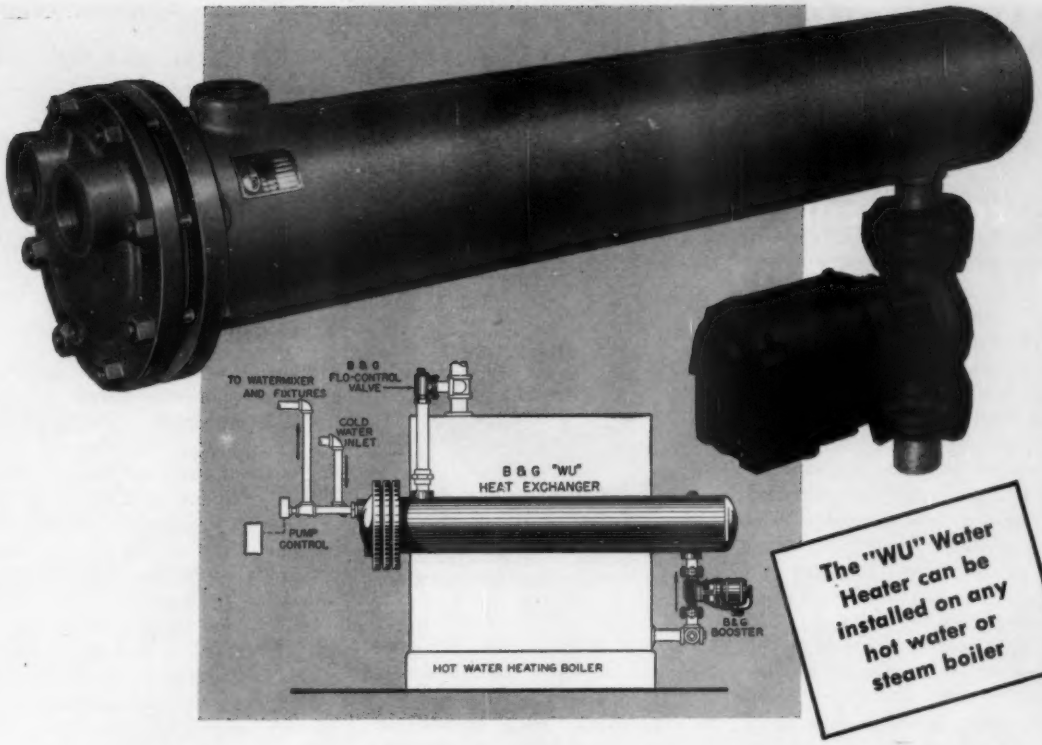
► Mr. Brandenburg's inquiry has been passed along to the author of the article, Roger N. Perry of the Norton Company, Worcester, Mass.—*Editors.*

Permission to Reprint

PLANT ENGINEERING:

"A reprint of the article from the July, 1958 issue of PLANT ENGINEERING on 'Car-Type Multipurpose Furnace' by R. A. Butler has just come to my attention. Since this article shows and discusses burners and other combustion equipment built by us, we are interested in publishing reprints for distribution by our field engineers.

"May we have your permission to reproduce this article?" *R. J. Reed, Application Engineer, The North American Mfg. Co., Cleveland, Ohio.*


TO WATERMIXER AND FIXTURES
B & G FLO-CONTROL VALVE
COLD WATER INLET
B & G "WU" HEAT EXCHANGER
PUMP CONTROL
B & G BOOSTER
HOT WATER HEATING BOILER

The "WU" Water Heater can be installed on any hot water or steam boiler

HOW TO CUT WATER HEATING COST WITH A B&G TYPE "WU" INSTANTANEOUS HEATER

There are three reasons why a "WU" Heater will produce large volumes of hot water with maximum economy—

1. It ends the need for bulky, space-wasting storage tanks...because it is an instantaneous heater, heating water as rapidly as needed.
2. It eliminates an expensive, separately fired water heater...because it heats service water with hot water from the heating boiler, *winter and summer.*
3. It lengthens boiler life...because it requires summer operation of the boiler, preventing the rapid deterioration which occurs when a boiler is idle.

Pumped circulation steps-up capacity

The "WU" Heater is equipped with a B&G Booster Pump which pumps boiler water through the heater shell, thereby greatly increasing the capacity of the Heater. An unbelievably small unit produces large volumes of hot water. Service water temperature is closely controlled...the Booster starts whenever the water goes below the desired degree and continues to run until service water is again at the proper temperature.

B&G ALL-BRONZE BOOSTERS

For long life in circulating hot or cold raw service water

The corrosive effects of continuously pumping fresh water materially shortens pump life unless a bronze unit is used. The B&G All-Bronze Booster is specifically built for such applications. Now painted bronze for easy identification.

Send for free booklet on application, selection and installation of B&G Instantaneous Water Heaters.

Reg. U.S. Pat. Off.

BELL & GOSSETT COMPANY

Dept. FP-53, Morton Grove, Illinois

Canadian Licensee: S. A. Armstrong Ltd., 1400 O'Connor Drive, Toronto 16, Ontario

For more facts circle 529 on Reply Card

PLANT ENGINEERS' DIGEST —so those who rush may read and know what's new

Edited by Marjorie E. Weissman

Handling Explosive Chemical

IN THE MANUFACTURE of molded plastic products, the Hawley Products Co., St. Charles, Ill., stores and transfers more than 12,000 gal of toluol every month.

The chemical is stored in a 12,000-gal tank about 200 ft from the manufacturing building. A close-coupled vertical turbine pump transfers the liquid from the storage tank to the two processing or manufacturing areas inside the plant. The pump is controlled at both processing locations and at the pump site itself.

Mounted with the discharge head bolted gas-tight to the hatch, the pump extends to a sump in the bottom of the tank. This permits the impellers to be in the solution at all times and also permits the complete evacuation of the tank.

Vertical turbine pump installed in storage tank transfers toluol to plant area.

Several specifications for handling the chemical were submitted to insurance underwriters, but were not approved. They included the use of a pump house and use of a centrifugal pump. The 1½-hp explosion-proof turbine was the answer that satisfied the underwriters. *From a release of the Deming Co., Salem, Ohio.*

Spiral Nails for Wood Panels

USE OF SPIRAL nails in the prefabrication of wall panels has resulted in increased efficiency on the assembly line at the West Newton, Pa. plant of Admiral Homes, Inc.

The company, which builds about 700 homes a year, has adopted the spiral nails for almost all of the fastening for which they formerly used smooth shank nails.

One of the biggest advantages of the spiral nail is that it has eliminated splitting and the subsequent time lost on the assembly line in replacing lengths of wood that were not acceptable.

(Continued on page 38)

Office Records Handling Equipment Doubles as Small Parts Assembly Aid

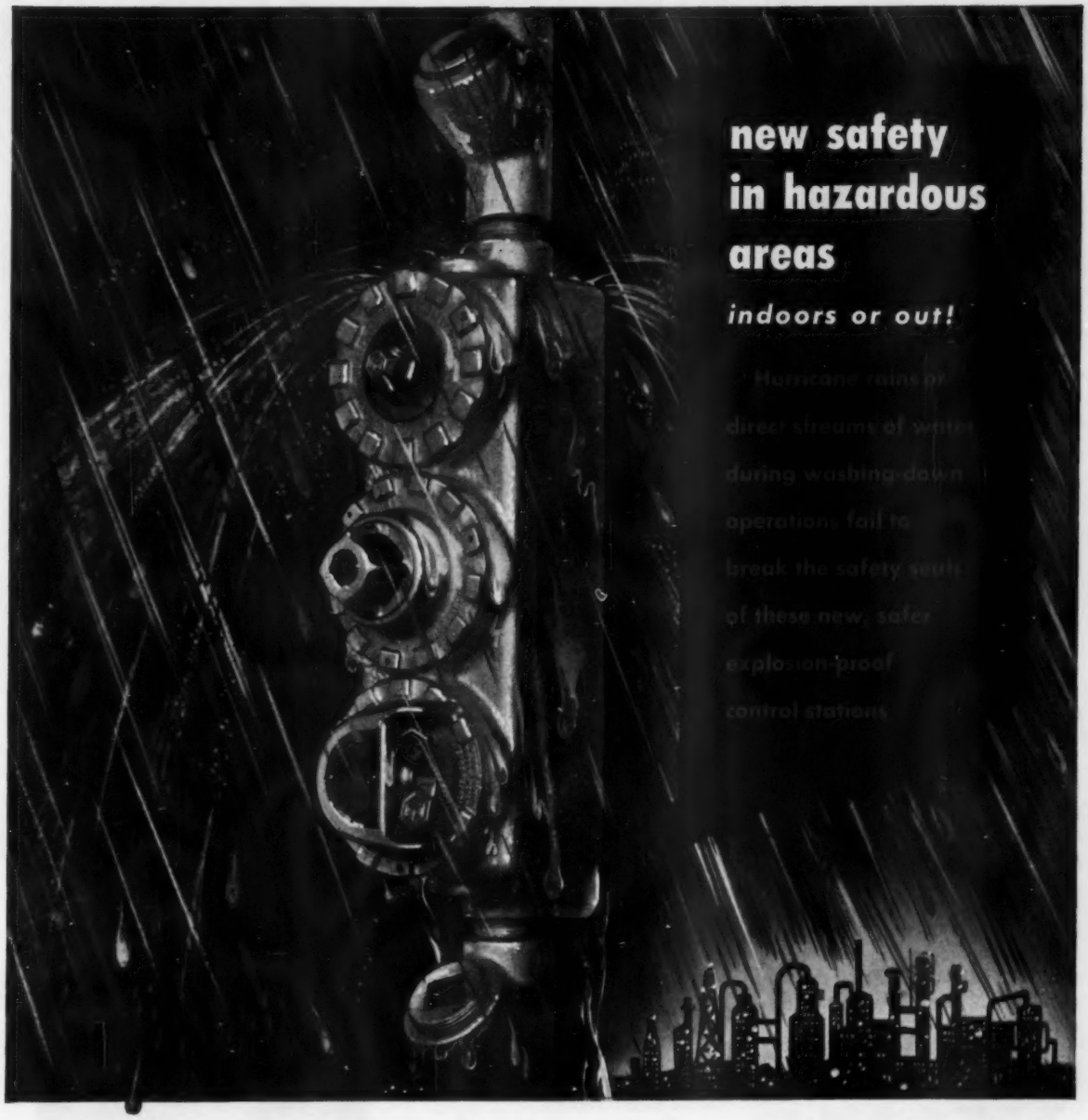
A NEWLY-inaugurated parts selection system is speeding assembly of valve bodies on production lines at a transmission manufacturing firm in Indianapolis. Small parts used in valve body assemblies formerly were housed in small parts baskets. Personnel involved in assembly work were required to move continually along the work bench, reaching for the various parts that made up the assembly. Dirt on small parts sitting in the open also presented a problem.

Files (arrow) normally used for office records are motorized, now handle parts.

To overcome this problem the assembly procedure was divided into three phases and three motorized machines, normally used in offices for record handling, were installed. Each of the motorized files is fitted with 32 small parts baskets, and at a touch of a foot control, the machine brings the needed parts to convenient work bench level.

The parts baskets are arranged on eight levels, in sequence of assembly. The assembler needn't go after the parts since the machine automatically brings them to him. Each of the motorized files contains a specific number and group of parts to assemble. As one particular group of parts is assembled into the valve body, the body is moved to the next station until the unit is complete.

Less floor space is required with this assembly arrangement and personnel travel has been greatly reduced. *From a release of Diebold, Inc., Canton, Ohio.*



NEW THREADED-JOINT NEOPRENE-SEALED

Control and Indicating Stations

Explosion-proof, dust-ignition-proof, weather resistant and water-tight (NEMA 4), this new Condulet® EWC series affords safety greater than ever before for pilot lights, heavy-duty push-button stations, selector switches, or various combinations thereof in single, double or triple gangs.

Designed expressly for Class I (Groups C and D) and Class II hazardous areas, the new series features a Feraloy® housing with *threaded* cover and *threaded* operating-shafts throughout. Cover, shaft housing and pilot light jewels are tightly sealed with Neoprene O-rings, effectively shutting out fumes, dusts, all water.

Write direct for descriptive literature and specifications, or contact your Crouse-Hinds distributor

CROUSE HINDS

MAIN OFFICE AND FACTORY: SYRACUSE, NEW YORK
Crouse-Hinds Company of Canada, Ltd., Toronto, Ont.
Crouse-Hinds Instrument Company, Inc., Silver Spring, Maryland

• CONDULET® ELECTRICAL EQUIPMENT (Explosion-Proof and Conventional) • FLOODLIGHTING
• TRAFFIC CONTROL SYSTEMS • AIRPORT LIGHTING and WEATHER MEASURING EQUIPMENT •

These products are sold exclusively through electrical distributors. For application engineering help, contact one of the following offices: Baton Rouge Birmingham Boston Buffalo Chicago Cincinnati Cleveland Corpus Christi Dallas Denver Detroit Houston Indianapolis Kansas City Los Angeles Milwaukee New Orleans New York Omaha Philadelphia Pittsburgh Portland, Ore. Salt Lake City St. Louis St. Paul San Francisco Seattle Tulsa Washington Resident Representatives: Albany Atlanta Baltimore Charlotte Chattanooga Jacksonville Reading, Pa. Richmond, Va.

For more facts circle 530 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 36)

Spiral nails are used to assemble these wall panels for a prefabricated house.

The company has found that the 16-penny spiral nail takes one stroke less to drive than conventional nails, which means a substantial saving in arm-power. Tests have shown that the nails, which operate on the same principle as the screw, have as much as 200 per cent more holding power than smooth shank nails.

Sizes of spiral nails used are 16d for framing and floor joists; 8d for sheeting, both on top of floor joists and on the roof; and 6d for plywood floor sheeting. *From a release of Jones & Laughlin Steel Corp., Pittsburgh, Pa.*

Pneumatic Tube Hastens Orders

A NOVEL office-to-plant pneumatic tube network installed by the Rolled Steel Corp., Skokie, Ill., has enabled the company to assemble orders for shipment within minutes after sales are made.

Pneumatic tube system between office and plant speeds steel order handling.

The 410-ft long tube leads from the inventory control department in the administrative wing to the order programming department at the far end of the adjacent warehouse.

After a sale is completed over the telephone, the salesman leaves his desk with the completed order form, erases the entry from a giant inventory chalkboard in the sales office, establishes credit, and immediately turns the order over to the inventory control department. Here the paper work is assembled and routed to the order programming department through the big tube.

The tube comes into play again minutes later when the programming director puts the work order back into another tube directed to the receiving stations nearest the location of the steel which has been ordered. The order is picked up by crane and wrapped for shipment.

When the order is shipped, the paper work is put back into the tubes for the last time and routed to the billing department where the invoice is prepared. The order filling process utilizes the tube network on four separate occasions, eliminating manual handling considerably. *From a release of Rolled Steel Corp., Skokie, Ill.*

Plastic Rope Slings

USE OF MYLAR plastic ropes instead of conventional manila or steel cable, in load slings for industrial hoists, has given Insul-8 Corporation, San Carlos, Calif., operating economies and an improved workmen's safety record.

More satisfactory hoisting operations also have resulted, due to the particular type of material handled.

A two-year-long, constant-use test of the slings recently was completed by the company. These results were reported by the plant superintendent, Donald H. Scofield: The plastic slings have out-worn manila slings better than six-to-one and are still in use. Mylar's high tensile strength makes it possible to replace 1-in. diam natural fiber rope with easier-to-handle ½-in. plastic rope.

Mylar is not subject to kinks or sets caused by loading.

Minor in-plant accidents such as workmen cutting their hands on broken threads in steel slings have been eliminated.

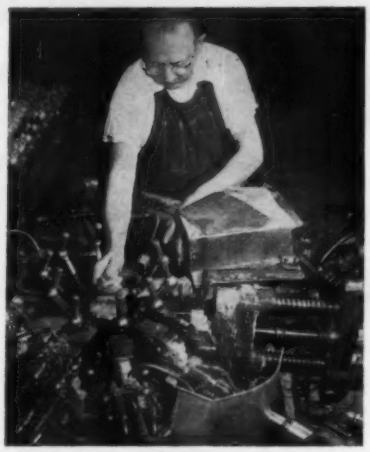
Plastic rope sling handles materials without marring them, is safe for hands.

The plastic rope does not scratch the plastic and steel stock constantly being hoisted in the plant. *From a release of U. S. Plastic Rope Inc., Redwood City, Calif.*

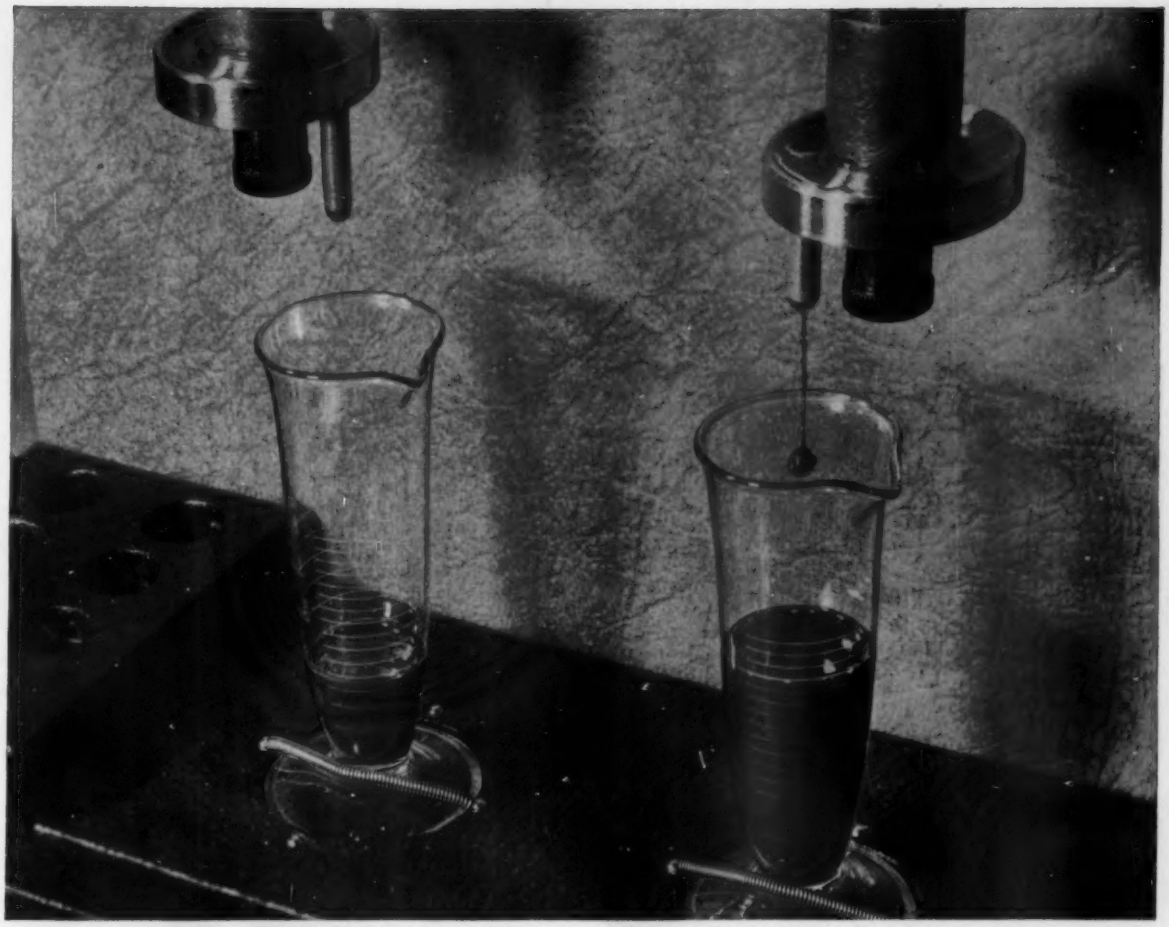
Change in Cutting Oil Raises Production of Valves

THE BODY OF EACH oven temperature control valve made by the Wilcolator Co., Elizabeth, N.J., requires eight machining operations and the plug, which controls the flow of gas, requires three machining operations. Thousands of these control valves are turned out daily, with very few rejections.

In order to achieve production speed, the company tried a number of different cutting oils, especially in



Critical holes in body of control valves are machined on this 10-spindle tool.



The oils collecting in these graduates are being forced, at 100 psi, through two sintered bronze bearings. Although each oil has the same viscosity, the Suntac on the left is leaking *only one quarter as much as* the straight oil on the right.

Desk-top demonstration proves that SUNTAC HYDRAULIC OILS can cut your oil losses . . . up to 75%

Suntac® oils are competitive in price, competitive in quality, *and unique in their ability to reduce oil leakage without costly shutdowns.*

Suntac oils are high-quality, exceptionally stable mineral oils especially compounded to reduce leakage. Experience proves that they give longer pump and seal life with higher overall operating efficiency.

See for yourself how a Suntac oil can cut your oil costs. A simple desk-top demonstration will show you how.

Ask your Sun man to show you how others have reduced oil consumption, or write to Dept. PY-2.

Industrial Products Department

SUN OIL COMPANY, Phila. 3, Pa.

SUNOCO

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In Canada: Sun Oil Company Limited, Toronto and Montreal

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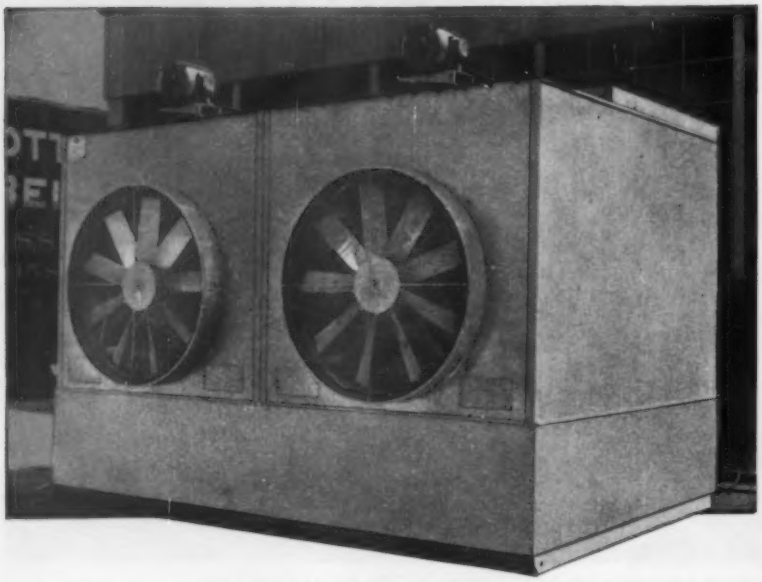
NEW LOW-COST APPROACH TO PROCESS WATER COOLING



COST OF WATER CONSERVATION IS DOWN! The initial investment, installation and operation costs of these new dual model Aquatowers is so low that no plant can afford a "hot spot" that wastes 200 to 400 gallons of water per minute. They make water wasting impractical, unprofitable.

These large capacity packaged cooling towers reach the job completely assembled, ready for work—require only simplest wiring and piping. Maintenance is just minutes per month.

Operational flexibility of these 2-fan Aquatowers is outstanding. They match their performance to any climatic demand for cooling welding equipment, moulding presses, quenching operations or any process demand your plant presents. For refrigeration, these new models are nominally rated at 80, 100 and 120 tons, respectively.

If plant operation is your responsibility, learn why these large Aquatowers really make water conservation good business for *your* plant. Call the Marley engineer in your city or write to

Aquatower is the Registered Trademark of

MARLEY **The Marley Company**

Kansas City, Missouri

For more facts circle 532 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 36)

the machining of aluminum bodies and plugs. Since the experiments started, production has been increased 11½ per cent by using Gulfcut 11D for machining aluminum. This increase was obtained through extending the number of hours machine tools will cut before they require grinding and lapping. Tool changeover requires at least 30 min in addition to the time spent grinding and lapping them.

Not only has tool life been increased, but other advantages include better finish, greater safety, no cutting oil stain and no contamination of the degreasing solution. *From a release of Gulf Oil Corp., Pittsburgh, Pa.*

Giant Size MH Job

By employing an oversize "homemade" welded steel positioner, 27-ton frame of scrap press was tilted at 25-deg angle to place it within reach of horizontal boring mill that finish-machines angles. (From a release of Baker Perkins Inc., Saginaw, Mich.)

Preheat Speeds Tile Glazing

BY PREHEATING TILES, the glaze can be applied and dried with split-second timing, allowing operators to pick up and place the tiles immediately on moving racks. Because the glaze dries so rapidly, the spray does not run over the edge of the tiles and the surfaces are not marred by handling.

The tile ware, made by the Ro-

Here's Quick, Permanent Solution To Many Plant Construction Problems:

ARMCO CORRUGATED METAL STRUCTURES

Meeting the basic need of underground structures for plant operations can have many answers. But for fast construction, dollar savings, permanence and a minimum of maintenance, you'll find Armco Corrugated Metal Structures provide the *best* answer. Look how you can use them.

UNDERPASSES

Big, sturdy Armco MULTI-PLATE® Structures, available in a variety of sizes, shapes and gages, are an economical tool for the design and construction of underpasses and similar structures where you need clearance for trucks and other big vehicles. Many serve as grade separations between plant traffic and public or private thoroughfares.

UTILITY AND PEDESTRIAN TUNNELS

Tunneling is often the best answer for installing conduits, pedestrian underpasses and similar structures under existing facilities. When you tunnel, you save the surface. When you tunnel, do it quickly and safely with Armco Liner Plate. Pound for pound, it's the strongest tunnel liner plate made.

SEWERS AND CONDUITS

For sewers, conduits, culverts—practically any drainage need—specify Armco Pipe to meet your exact requirements, from size to service conditions. Long lengths help speed installation, keep costs down.

WRITE FOR FREE LITERATURE

Tell us about your specific drainage and construction plans. Armco Drainage & Metal Products, Inc., 4819 Curtis Street, Middletown, Ohio.

ARMCO DRAINAGE & METAL PRODUCTS

Subsidiary of ARMCO STEEL CORPORATION

OTHER SUBSIDIARIES AND DIVISIONS: Armco Division • Sheffield Division • The National Supply Company
The Armco International Corporation • Union Wire Rope Corporation • Southwest Steel Products

For more facts circle 533 on Reply Card

SPENCER Vacuum

Assembly and Gaging Dept., Miniature Precision Bearings, Inc., Keene, N. H.

KEEPS "WHITE ROOMS" WHITE

Dirt and dust are strictly bad news around gaging or assembly areas of a company producing precision ball bearings. Every possible precaution must be taken to assure an absolutely dust-free atmosphere in the "white rooms".

That's why, at plants like this modern Miniature Precision Bearings, Inc. factory, you'll find SPENCER vacuum cleaning systems providing *sure* sanitation.

Whether your cleanliness requirements are critical . . . or whether *convenience* and *economy* of maintenance are primary, you'll find a SPENCER system the answer to your needs.

Write for complete information on SPENCER installed vacuum cleaning systems or request a piping layout to meet your particular requirements.

The SPENCER TURBINE COMPANY
HARTFORD 6, CONNECTICUT

OTHER QUALITY SPENCER PRODUCTS

PORTABLE VACUUM CLEANERS

PNEUMATIC CONVEYING SYSTEMS

BLOWERS

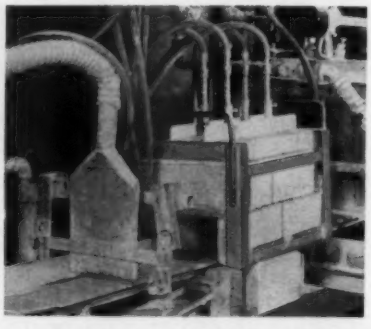
For more facts circle 534 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 36)

bertson Manufacturing Co., Morrisville, Pa., is moved on a conveyor under a small brick-lined hood containing four burners, where it is preheated before entering the glaze-spraying system.

The burners are actually refractory-lined furnaces in which heat can be released at rates as high as 40 million Btu per cu ft per hr. At



Tiles are heated in miniature "furnace" before entering glaze-spraying system.

a temperature of about 3000 F and velocities up to 2500 fps, the burned gases cut through the "dead" air film around the tiles. Production rate is 108 tiles a minute. *From a release of Selas Corp. of America, Dresher, Pa.*

No Manual Handling In This Battery Charging Area

AN ENTIRE TRUCK battery charging operation has been fitted into a space 16 ft square at the Kress Box Co., Pittsburgh, Pa. Seven charging units, serviced by a series of roller platforms, have been installed in this area.

At the end of each shift, discharged batteries are replaced by lifting charged ones with an overhead hoist mounted on a monorail which passes over the center of the roller tracks. This allows the batteries to be placed on the track and moved in either direction.

Before placing a battery on charge, the water level of each cell is checked and the water lost by evaporation is replaced by water from an automatic filling device. Replacing water before charging, allows the

Adding 270 lbs. of carton-strength with J-M Dutch Brand Strapping Tape

Dutch Brand Strapping Tape multiplies many times the weight a package can carry . . . keeps goods safe during shipment. Tough vinyl backing and strong glass strands give this strapping tape a tensile strength of 270 pounds per inch of width.

One man can apply Dutch Brand Strapping Tape with a simple hand dispenser. The pressure-sensitive adhesive holds quickly, even on irregular surfaces . . . permits using short strips instead of wrap-around lengths. Dutch Brand Strapping Tape comes from the roll cleanly, without splits. Resists abrasion. Not effected by rot, water, oil, or grease. Can be imprinted if you wish.

Investigate Dutch Brand Strapping Tape. See how it saves time on the line—saves work in packaging, palletizing, and bundling – saves money. See why it makes an ideal "tear-strip." Write today for new "idea book" giving dozens of profitable uses.

JOHNS-MANVILLE JM PRODUCTS

JOHNS-MANVILLE DUTCH BRAND DIVISION
7800 S. Woodlawn Avenue, Chicago 19, Illinois

JOHNS-MANVILLE

For more facts circle 535 on Reply Card

PLASTIC PIPE AD WITH NO PICTURE?

Why no picture: Because almost all plastic pipe looks the same. You know yourself that looks can be mighty deceiving, and piping that goes wrong can be mighty expensive. A picture means nothing... but...

There are scores of brands of plastic pipe on the market... made of a dozen different kinds of materials. Most of it is labeled "corrosion-resistant" but the results may be good, bad or indifferent depending on your choice. A picture is no help. Here's what to look for instead:

The universal material? No such thing. No one plastic can handle all liquids and gases... no one has *all* the physical properties required of a truly universal pipe. Closest to it are Ace Riviclor (Rigid PVC) and Ace-Ite (rubber-plastic blend). The former is a little better on chemical resistance, the latter is a little better on impact strength and heat resistance. Both same price.

Are plastics strong enough? Thousands of chemical plants say "yes". Pipe is now available in several wall thicknesses... in flexible tube sizes (Ace-Flex clear transparent), up through gas-tubing sizes (Ace-Ite and Ace Riviclor), through flexible Supplex polyethylene pipe, and Schedules 40 and 80 rigid plastic pipe for pressures up to 490 psi.

Above that, there's Ace rubber-lined steel pipe. And don't forget Ace soft-rubber-lined pipe for resistance to abrasion.

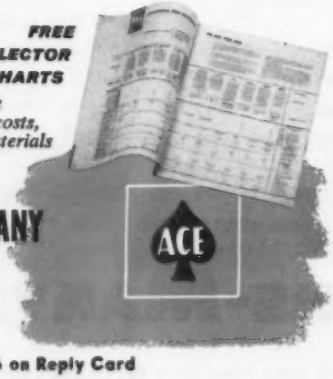
Where do I use it? For corrosive chemicals and gases of all types. The only ones that are difficult are certain solvents and chlorinated aromatic hydrocarbons, and if you're careful to pick the right *one* of the *many* Ace materials, you can even handle most of these tough corrosives. Use plastics, too, for water lines, gas lines, electrical conduit, etc., or any lines where the pipe passes through corrosive vapors or damp areas, or goes underground.

Is there a plastic for hot corrosives? Yes, Ace Tempron, which is good to 275 deg. F. with most chemicals. Stays chemical resistant, strong, and rigid where other plastics may be attacked or may sag.

How can I dodge "trial and error"? Go to a company that has no axe to grind. We, for instance, make no less than nine different kinds of pipe ... with fittings and valves to match... and give you thoroughly unbiased advice backed by 100 years of experience and prices as low as you'll find anywhere.

FREE SELECTOR CHARTS

20 valuable pages...comparable properties, chemical resistance, costs, etc. of 11 plastics and rubber materials Write today for Bulletin CE-50.



AMERICAN HARD RUBBER COMPANY
Division of Amerace Corporation
ACE ROAD · BUTLER, NEW JERSEY

For more facts circle 536 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 36)

electrolyte to become thoroughly mixed during charge.

Batteries that have accumulated soot and dirt in the trucks are placed in a drain outside the battery charging area and washed with brush and water. The batteries are dried with an air hose. Once a month, the battery covers are washed with baking soda to remove any acid that may have been spilled on them.

Once each week, batteries receive an 8-hr equalizing charge. The specific gravity readings are taken and recorded on all cells before and after such charging and if any cell does not come to a fully charged condition, the cause is determined and corrected.

Hoist facilitates battery changing at end of shift. Batteries placed on roller track, can be moved to right or left.

Records of charging operation include tabulation of battery number, specific gravity, when put on charge, time charge is completed, and number of trucks to which the batteries are assigned. By referring to the maintenance charts, possible irregularities in performance can be detected and corrective measures taken before the battery is damaged. *From a release of Gould-National Batteries, Inc., Trenton, N. J.*

Tractor, Backhoe Help Install Electric Cable Underground

A NEW WAY OF PLACING buried electric cable under sidewalks and streets has been developed by

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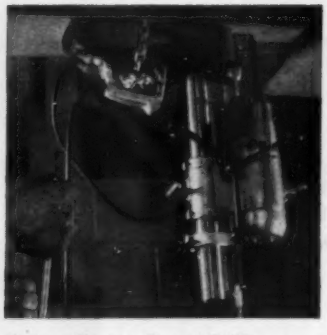
There's a Black & Decker Drill powered for every job!

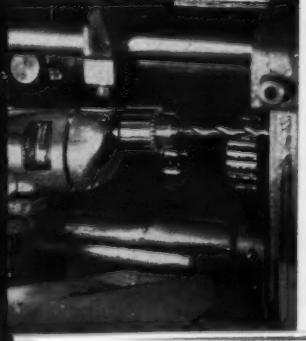
LITTLE SHORTY'S the drill you want for those hard-to-get-to, around-corner jobs. Gets in tight spots! Excellent for small unit assembly.



DRILLS UPSIDE DOWN! B&D Magnetic Drill Press sticks to the wall like a fly; operates manually or with exclusive remote control.

TREMENDOUS TORQUE for the tough jobs. ½" H.D. Holgun® is geared and powered to take on the hard ones. Compact to work in close quarters.

MOST POWERFUL drill of its size available, the ¾" Standard! A rugged tool with plenty of zip in reserve. Fully reversible; positive drive chuck.



71% of purchasing agents say make mine Black & Decker!

A recent industrial publishing company survey reveals that when purchasing agents need electric tools most think first of Black & Decker! One reason why: 33 *different* drills each designed to give you the power you need *plus* easy handling and long, troublefree life!

If you have a drill problem—a small hole in trim to a large hole up among the structural steel—be sure to see Black & Decker. Better still, mail the coupon for a free demonstration of our drill line. THE BLACK & DECKER MFG. CO., Dept. 0802, Towson 4, Maryland. (In Canada: Brockville, Ontario).

Leading Distributors Everywhere Sell

Look Under "TOOLS-ELECTRIC" in Yellow Pages

Black & Decker®

Quality Electric Tools . . . Power-built for top performance

MAIL COUPON FOR FREE DEMONSTRATION

THE BLACK & DECKER MFG. CO., Dept. 0802, Towson 4, Md.

☐ Please arrange for a demonstration of the following drill(s) .....

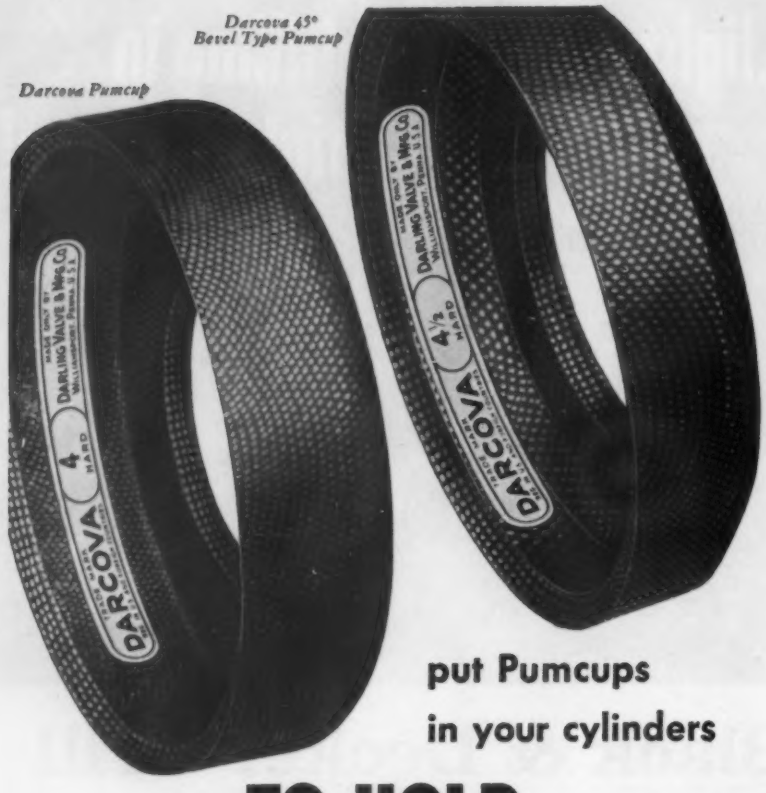
☐ Please send me additional information.

Name..... Title .....

Company.....

Address.....

City..... Zone..... State.....



put Pumcups
in your cylinders

TO HOLD PRESSURE LONGER!

In Darcova Pumcups a sound engineering principle has been combined with precision tolerances and extremely durable compositions to provide exceptional efficiency and life in hydraulic, air, and reciprocating pump cylinders of all kinds.

Unlike ordinary piston packing, precision Pumcups are engineered to minimize friction load while hugging cylinder walls on every pressure stroke. Regardless of eventual wear, efficiency *stays* high! So there's far less down-time and need for replacement.

Pumcups are made in a wide range of sizes, types and texture-engineered compositions, including 100% Nylon, for all kinds of pressure-temperature-fluid conditions. Send for Pumcup Bulletin 5503 and weigh all the facts!

DARLING VALVE & MANUFACTURING CO.
Williamsport 14, Pa.

DARCOVA
THE ORIGINAL COMPOSITION CUP
TRADE MARK
PUMCUPS

For more facts circle 538 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 36)

the Contracting and Material Co., Evanston, Ill., who installed more than seven miles of street lighting in Chicago, Ill. Normally, the cable is placed in trenches dug in the open parkway between sidewalk and street, a procedure frequently interrupted by obstructions.

Instead of tearing up the sidewalks, the company used a tractor equipped with a backhoe to push a pipe carrier through the ground under the pavement.

Capped at the front end to prevent plugging, the pipe is headed in the desired direction and then pushed through the ground with the bucket of the backhoe. Once this is done, it is an easy matter to thread the cable through the pipe.

Although the Contracting and Material Co. has a hydraulic ram de-

Quick method of placing electric cable under sidewalks and streets is to push pipe through ground with a backhoe.

signed especially for this type of work, the job is performed much faster with the tractor, regularly used to dig trenches, excavate holes for connection boxes and other excavations along the line. In the pinch hitting role of pipe-pusher, the tractor has driven as much as 500 ft of pipe under streets and other barriers in a single day. *From a release of International Harvester Co., Chicago, Ill.*

WESTINGHOUSE SUPER-HI™ FLUORESCENT LAMPS ARE 2½ TIMES BRIGHTER!

Rosie's just collected an armful of posies from the boss. Since they put in Westinghouse Super-Hi fluorescent lamps, everything's looked brighter (2½ times brighter than with regular fluorescents, in fact) and Rosie's efficiency has soared.

Of course what Rosie didn't know is that:

- **"Ultralume"™ phosphors maintain maximum light levels for the life of the lamp.**
- **Special cooling chambers give *longer life*, as well as more light.**
- **New leads are chromium-vanadium plated to eliminate end-darkening.**
- **Smooth, slim design gives uninterrupted brightness all around the tube . . . much lighter weight for safer, easier handling.**
- **They're interchangeable . . . can be used in any fixtures designed for new high intensity lamps.**

This all made the boss very happy, too. He found not only were morale and efficiency higher, but that he could save money while getting more light from the same number of fixtures.

Why not get the details for yourself? Just call your local Westinghouse agent, or write—Westinghouse Lamp Division, Dept. 57-L-5, Bloomfield, New Jersey.

YOU CAN BE SURE...IF IT'S Westinghouse

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SILICONE RUBBER INSULATED *BY ROCKBESTOS* OFFER YOU:

Excellent dielectric strength — electrical properties remain constant from −130°F to +500°F.

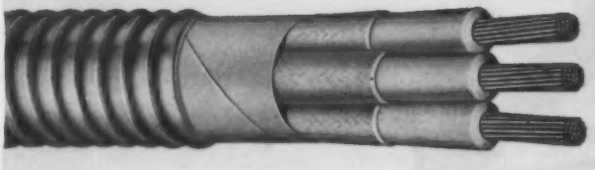
High heat resistance — better than any type rubber insulation. Long service life in temperatures to 125°C (power cables) and 200°C (other applications).

Excellent moisture resistance — unrestricted applications in wet or dry locations — equal to the best grades of rubber. No lead sheath required.

Greater ozone resistance than the best grades of rubber insulated cables.

Excellent resistance to chemical attack — being chemically inert, silicone rubber insulations resist effects of lubricating oils and most corrosive atmospheres.

Long life — excellent resistance to weathering and aging.



600 and 5000 VOLT MULTI-CONDUCTOR POWER CABLE

Silicone rubber insulated power cable combined in a 3 or 4 conductor construction, with interlocked armor overall . . . easily installed with simple supports . . . eliminates conduit . . . greater current carrying capacity for economical power distribution.

MULTI-CONDUCTOR CONTROL CABLE

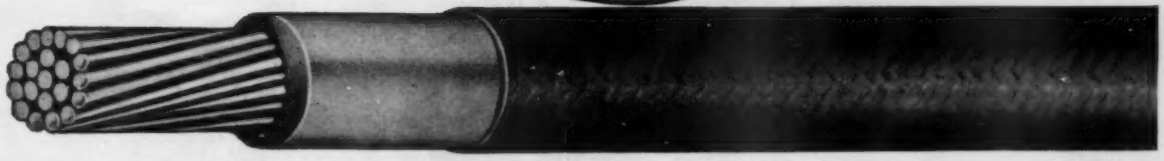
For use in steel mills, power stations, boiler rooms, automotive, ceramic and glass plants as well as other industries where control and signal circuits or control equipment are exposed to high ambient operating temperatures.

ROCKBESTOS PRODUCTS CORPORATION

NEW HAVEN 4, CONNECTICUT

NEW YORK • CLEVELAND • DETROIT • CHICAGO • PITTSBURGH • ST. LOUIS • ATLANTA • DALLAS
SEATTLE • LOS ANGELES • BURLINGAME, CALIFORNIA

WIRES

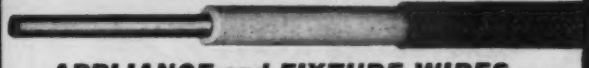


SILICONE RUBBER INSULATED POWER CABLE 600 and 5000 VOLTS

For high temperature circuits either in wet or dry locations, exposed or in conduit. This cable is recommended for use in steel mills, power stations, heat treat areas, boiler rooms, foundries, smelters, etc.

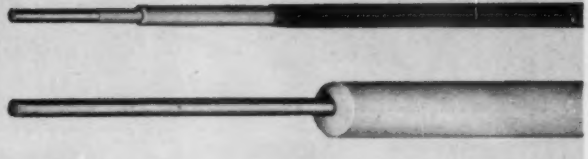
MOTOR LEAD and APPARATUS WIRES

For leads to motors, transformers, etc., requiring a flexible wire in high temperature locations or applications.



APPLIANCE and FIXTURE WIRES

For use in wiring high wattage units when operating temperatures reach 150°C and 200°C. Lighting fixtures, clothes dryers, electronic equipment, stoves, water heaters, ovens, therapeutic devices, space heaters are among the many products for which these wires are recommended.



HEATING CABLES and DEFROSTING WIRES

Heating cables are ideal for use in pipe heating, surface heating, roof de-icing and soil heating.

Defroster wires being odorless and tasteless are perfect for use as rapid defroster heating element in electric refrigerators and freezers.

ROCKBESTOS

For complete details on Rockbestos Silicone Rubber Insulated Wires and Cables send for Catalog SR58.

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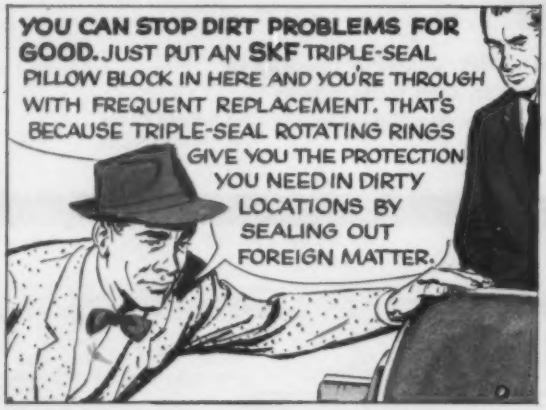
The real life adventures of DISTRIBUTOR DAN the SKF bearing man

IT'S THE BEARING IN THAT PILLOW BLOCK AGAIN– SHUT DOWN BY DIRT! AND DIRT WILL ALWAYS GET INTO IT–THERE'S SO MUCH OF IT AROUND HERE.


YOU CAN STOP DIRT PROBLEMS FOR GOOD. JUST PUT AN SKF TRIPLE-SEAL PILLOW BLOCK IN HERE AND YOU'RE THROUGH WITH FREQUENT REPLACEMENT. THAT'S BECAUSE TRIPLE-SEAL ROTATING RINGS GIVE YOU THE PROTECTION YOU NEED IN DIRTY LOCATIONS BY SEALING OUT FOREIGN MATTER.

LOOK, IT'S NEARLY IN ALREADY -AND IT'S EQUALLY EASY AND FAST TO INSPECT. BETTER CLEAN UP THE FLOOR NOW, TOO. LOOK AT THAT GREASE!
SKF

THERE'S AN SKF TRIPLE-SEAL "SAF" PILLOW BLOCK TO EXACTLY FIT YOUR REPLACEMENT REQUIREMENTS. CALL YOUR AUTHORIZED SKF DISTRIBUTOR FOR PROMPT SERVICE TODAY!
SKF
AUTHORIZED DISTRIBUTOR
7833

Spherical, Cylindrical, Ball, and "Tyson" Tapered Roller Bearings

EVERY TYPE–EVERY USE

SKF

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.

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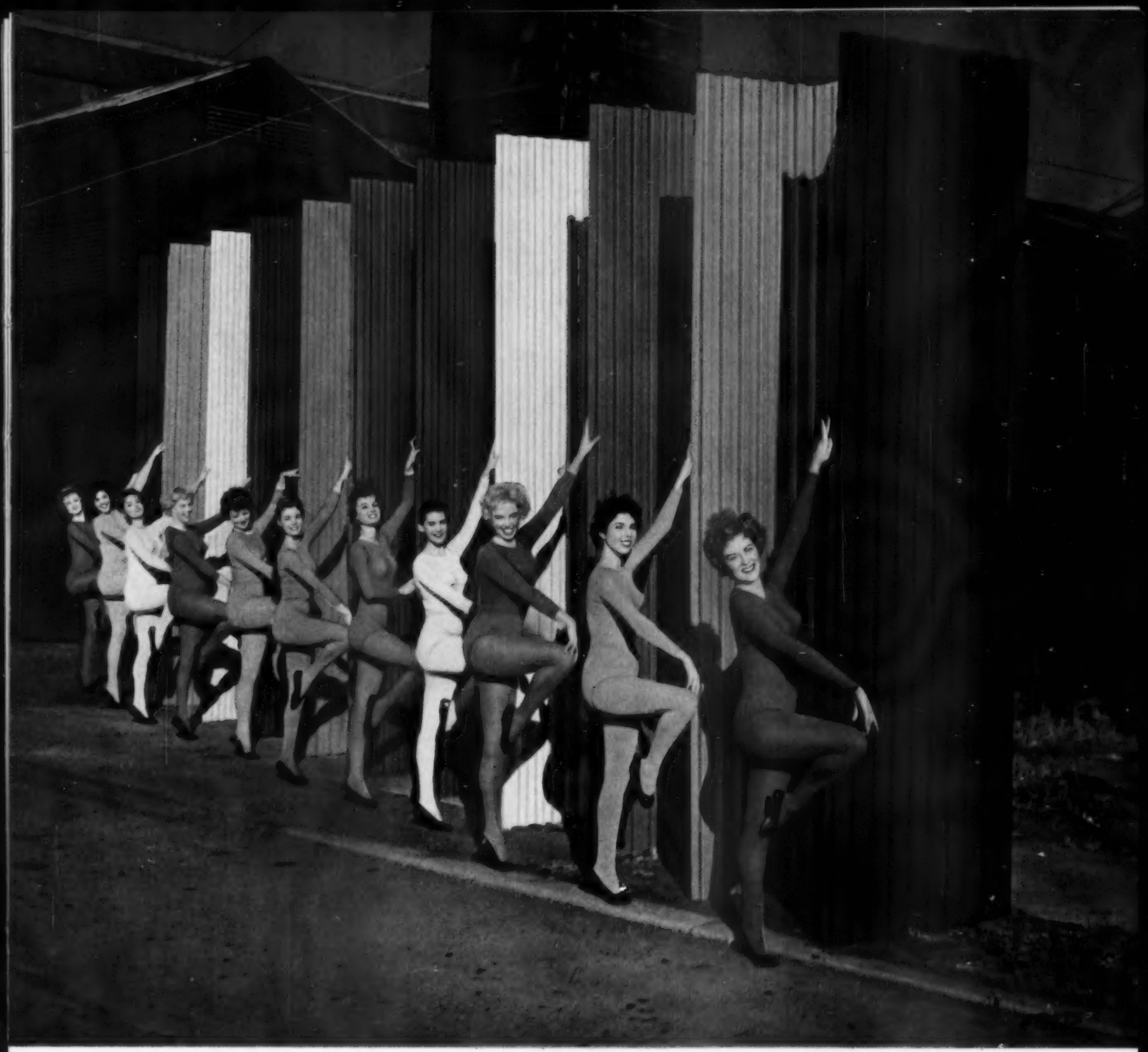


Copacabana Chorus introduces Alcoa Alumalure

New Alcoa "Alumalure" . . .
exciting beauty for buildings at low cost!

No more drab buildings now that new Alcoa® Alumalure is here. Alumalure* introduces color for aluminum-clad buildings at remarkably low cost! Alumalure adds the showplace appeal of 11 standard baked enamel colors to all the traditional advantages of building with aluminum—light weight, corrosion resistance, economy. It has endless possibilities. You can specify Alcoa Alumalure now for plants, schools, shopping centers and many other building types. Build a showplace at low cost. Contact your nearest Alcoa sales office today for complete information!

SEND FOR COLOR-SWATCH FOLDER!

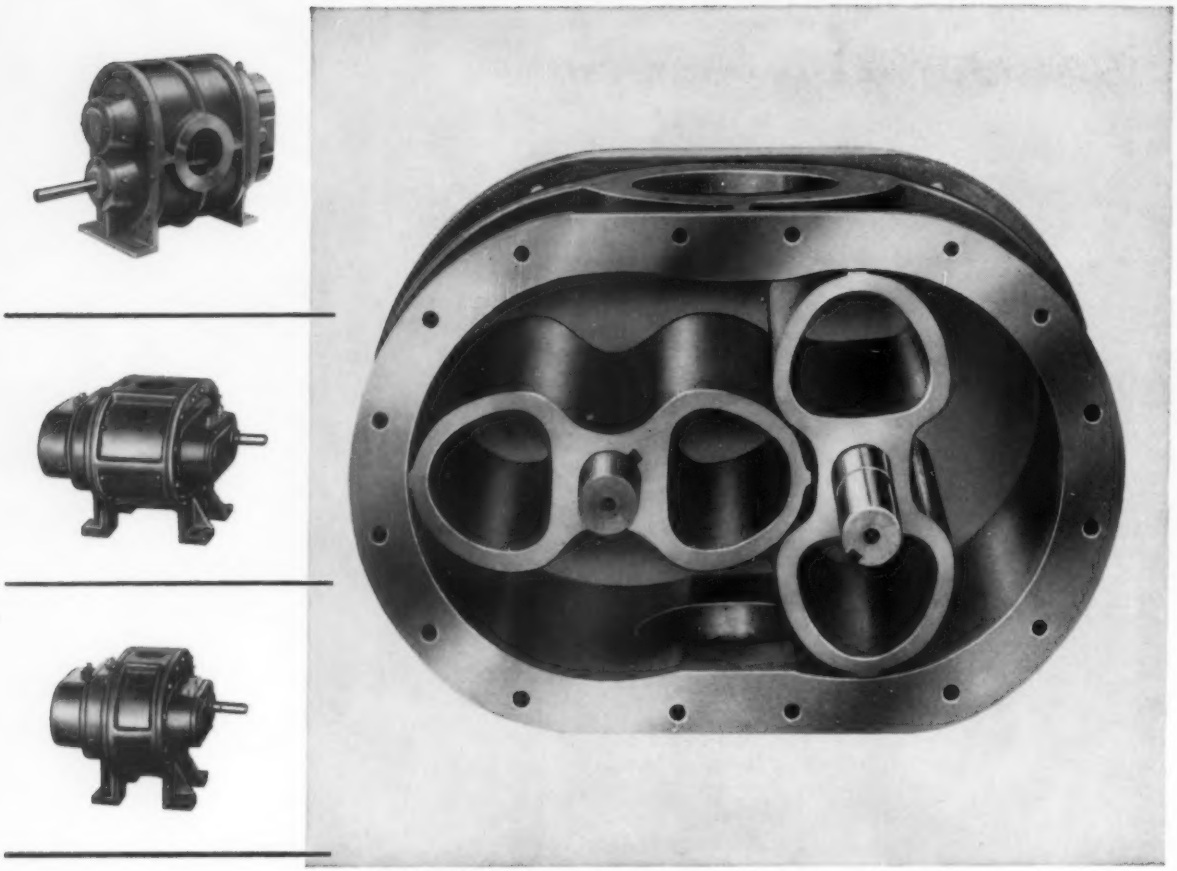
See all 11 exciting colors in the color-swatch folder that's yours for the asking. Call your nearest Alcoa sales office or write on your company letterhead to: Aluminum Company of America, 2068-B Alcoa Building, Pittsburgh 19, Pennsylvania.

ALCOA ALUMINUM
ALUMINUM COMPANY OF AMERICA

Your Guide to the Best in Aluminum Value

Specify Alumalure!

**Trademark of Aluminum Company of America*



Sutorbilt blowers deliver air or gas at capacities up to 20,000 cubic feet per minute and pressures or vacuums up to 10 pounds. Design incorporates two figure-eight impellers which rotate in opposite direction and deliver a metered volume of air or gas.

SUTORBILT BLOWERS ASSURE TOP PERFORMANCE AND DEPENDABILITY

You want peak performance . . . from a blower that needs no special attention. Sutorbilt *ruggedness* gives it to you! Cases, headplates and impellers are of sound, close-grained cast iron. Heavy-duty anti-friction bearings maintain factory clearances throughout long service life. Wide-face herringbone gears, —run in a bath of oil—are engineered to absorb heavy shocks without affecting precise timing of impellers.

These and other Sutorbilt design features —plus highest-quality manufacturing methods—assure maximum, maintenance-free service from Sutorbilt blowers and gas pumps. Write for illustrated brochure giving complete specifications.

Representatives located in principal cities. Consult your classified telephone directory.

SUTORBILT IS WELL BUILT

CORPORATION, 2966 East Victoria St. • Compton, Calif.

Subsidiary of Fuller Company, Catasauqua, Pa.

FULLER COMPANY GENERAL AMERICA TRADE MARK

ROTARY POSITIVE-PRESSURE BLOWERS AND GAS PUMPS WITH VERTICAL OR HORIZONTAL MOUNTING

1163
S-10

How RYKON GREASE

has performed in six tough applications

In just two years since introduction, RYKON Grease has stepped in to deliver lubrication in hundreds of applications where other greases have failed

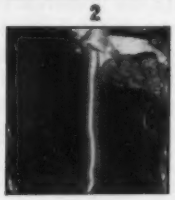
The reason RYKON Grease can perform under conditions that cause other greases to fail is this: RYKON Grease has a unique non-soap, organic thickener. This thickener holds the oil between its fibers better than any other gelling agent. The thickener is able to withstand extremely high as well as low temperatures. It resists chemical action and remains stable under conditions of severe working and water washing. RYKON Grease has exceptional anti-rust properties.

RYKON Grease's unique properties make it truly multi-purpose. This leads to many worthwhile economies. With one grease to do possibly every grease lubrication job in a plant, there's no chance for application mistakes. Inventory and handling of many single-purpose greases is reduced or eliminated. Maintenance training and supervisory follow-up is greatly reduced.

More facts about RYKON Grease are yours for the asking. Call the lubrication specialist in your nearby Standard Oil office in any of the 15 Midwest and Rocky Mountain states. Or write **Standard Oil Company (Indiana), 910 S. Michigan Ave., Chicago 80, Illinois.**

1

2



3

4

In the metalworking industry, where higher speeds, loads, temperatures and pressures are being put on bearings as a means of increasing productivity of equipment, a new type of grease has been needed. RYKON is that grease. Here are just 6 examples of how RYKON Grease has performed in tough spots:

Industry	Equipment	Type of Bearings	Conditions	Remarks
Metalworking	bearings over molten pot	—	high temperature	Temperature reaches 500° F. at times. RYKON stays in longer.
Steel Mill	pit crane, floor crane, charging car	plain and anti-friction	high temperature	Lasts twice as long as some other greases used.
Metalworking	drill head multi-spindle	anti-friction	heavy load	Other greases failed. Running cool on RYKON. No leakage.
Auto Manufacturer	switches on machine tools	—	wet	Good water protection and dielectric strength at a lower cost than previously.
Die Caster	die cast machines	various	high temperature	Cut down wear considerably.
Bearing Manufacturer	high speed spindle bearings	anti-friction	high temperature, heavy load	Lasts twice as long as a high priced bearing grease. Does not darken or form varnish.

You expect more from **STANDARD** *and you get it!*

Oven test shows high temperature performance of RYKON Grease. 1. Metal panel coated with RYKON and placed in oven at 350° F. 2. Same panel after five days. RYKON is still soft and ready to lubricate. 3. Another high-melt grease ready for same test. 4. Same panel after oven test. Grease has failed completely.

For more facts circle 544 on Reply Card

OPERATION AND PRODUCTION —pointers for the industrial plant engineer

Edited by Vern Kempf

Simple Loading System Speeds Welding Rigs to Job

Contributed by Allie P. Gray, Metal Shop Supervisor, Aro, Inc., Tullahoma, Tennessee

TRANSPORTING oxyacetylene welding rigs from place to place within our plant was usually accomplished by lifting the heavy units onto a pickup truck. This operation required four men and the procedure was reversed, when the rig arrived at the job site.

Delays were frequently encountered while men were rounded up to assist in loading and unloading. This problem was brought to our attention when one of the men in the lifting crew received a back strain resulting in four days disability.

A method of transporting the welding rigs was worked out that required only two men to load the unit and eliminated the heavy lifting. Two J-hooks were bolted to the underside of the rear bumper of the pickup truck. The bottom of these hooks has the same ground clearance as the bottom of the differential housing. A chain was also installed to hold the rig in place after it is mounted on the J-hooks.

Two holes were cut in the base of the cylinder carrier to fit over the J-hooks. To load the unit, the carrier is tilted so that the holes in the carrier are raised to a point above the J-hooks. Two men then push the welding rig up into position against the tailgate and secure it with the chain.

Holes in base of welding bottle carrier fit over J-hooks bolted to truck bumper.

Pivoting on J-hooks, rig is pushed up against tailgate and secured with chain.

Good Maintenance Practices Insure Long Troublefree Life for Lift Truck Batteries

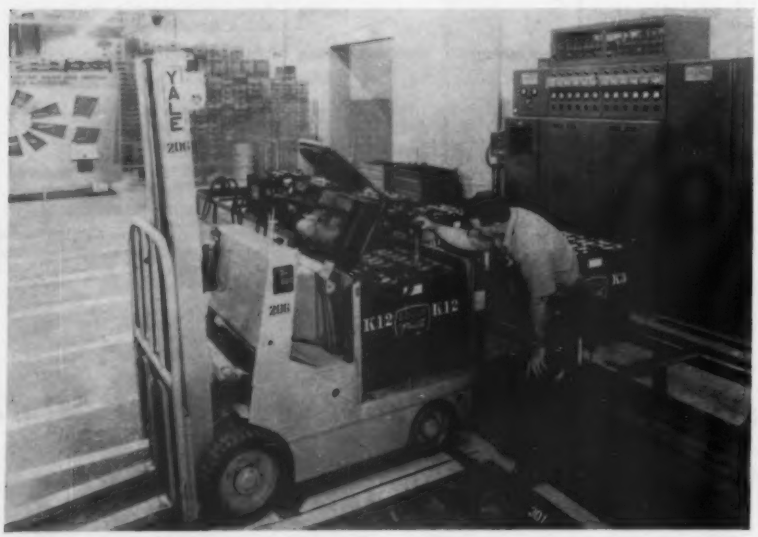
AIMED at achieving maximum battery life, a well-equipped battery and truck maintenance facility has been installed in a central location at the new plant of Automatic Electric Company, Northlake, Illinois. Occupying an area of 40 ft wide and 95 ft long, the area has charging and handling equipment to keep the fleet of 24 fork and powerized hand trucks in tiptop operating condition.

Following procedures recommended by field engineers of Gould-National Batteries, extra long leads are used to charge the batteries directly in the trucks as far as possible. The electrolyte level in the batteries is checked every fourth day. Water lost through evaporation is replaced with demineralized water processed in the plant.

Cleanliness is considered an integral part of battery maintenance. Each battery is washed with soda and water every two weeks in a special cleaning room located next to the charging line.

Records are kept on each battery in operation, with two special forms. The working form is a daily battery report that shows the truck number, the date and number of the battery installed in each truck. Each morning the maintenance operator records the hours of truck use shown on an elapsed-time meter and records the specific gravity of a pilot

(Continued on page 56)



Clean and well illuminated, this charging area insures proper care of batteries.

quickest TO ERECT

quickest TO INSTALL

quickest TO RE-ARRANGE

quickest TO PAY FOR ITSELF

DELUXE

STEEL SHELVING

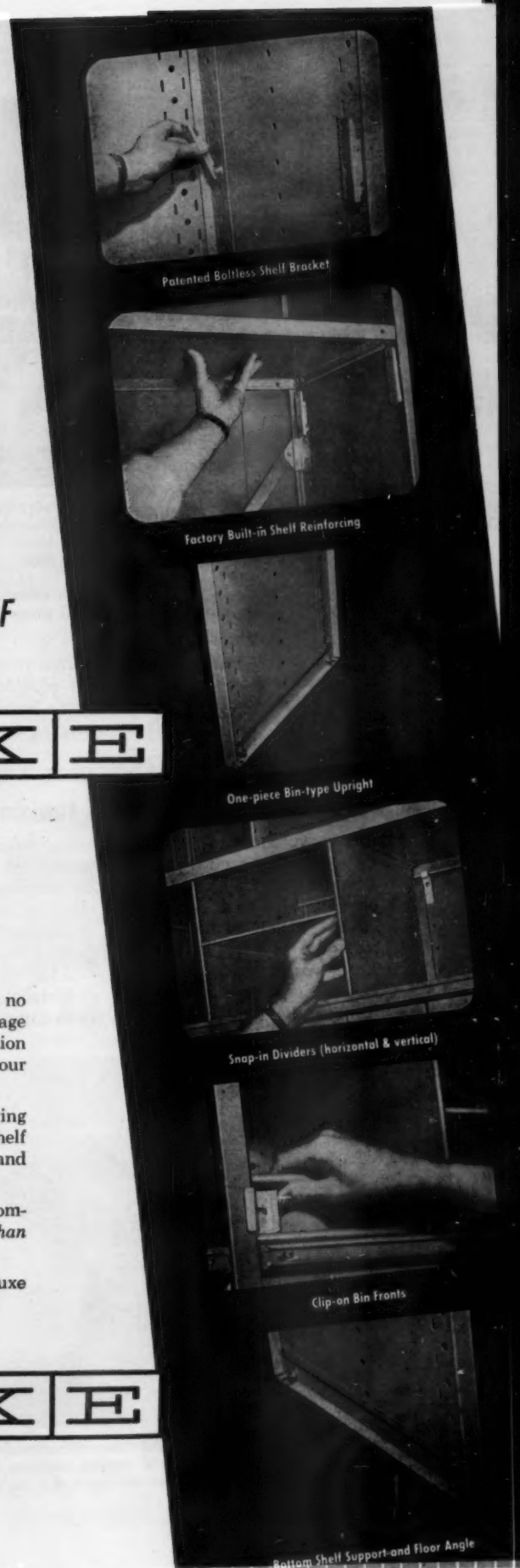
quickest BECAUSE...

. . . you realized that a shipment of knockdown shelving parts has no useful value. It must first be assembled into shelving racks for storage utility. The faster these racks are erected, the lower your installation cost. So, because Deluxe steel shelving is erected the quickest, your *installed cost* is the lowest.

The film strip shows 6 engineering features of Deluxe steel shelving that promote quickest erection. Take the patented Deluxe boltless shelf bracket . . . it replaces 90% of the time-consuming nuts and bolts and allows not only quickest installation, but easy shelf adjustment.

THE PROOF: At 1958 trade shows, two untrained girls erected a complete closed section of Deluxe Boltless Steel Shelving in *less than 5 minutes.*

Call your local Deluxe dealer or write for the new, complete Deluxe Shelving Catalog No. 30.


Patented Boltless Shelf Bracket
Factory Built-in Shelf Reinforcing
One-piece Bin-type Upright
Snap-in Dividers (horizontal & vertical)
Clip-on Bin Fronts
Bottom Shelf Support and Floor Angle

DELUXE

DELUXE METAL FURNITURE COMPANY · Warren 7, Pa.

A Division of the Royal Metal Manufacturing Company

For more facts circle 545 on Reply Card

OPERATION—PRODUCTION

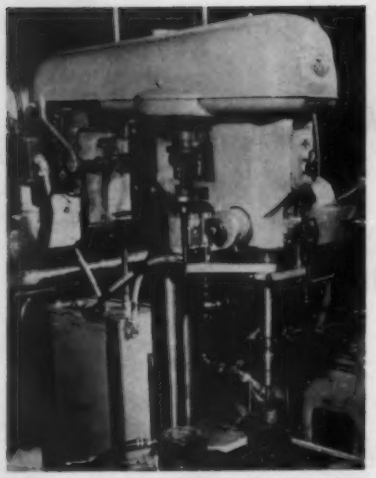
(O and P begins on page 54)

cell. When the battery is returned to the charging area, in a discharged condition, the specific gravity is again taken and recorded. Every ten days the information from these forms is transferred to a log maintained for each individual battery.

This summary of specific gravities gives a running record of the number of duty cycles each battery has been through. Periodically, these forms are sent to the engineering department for review.

How To Convert Your Drill Press to Tapping Machine

CONVERTING a standard drill press to a tapping machine has many advantages over the use of attachments commonly used to perform this work. Installing controls to permit reversing the drill press motor provides greater capacity for a given horsepower than when using tapping attachments. Up to 25 per cent of the available horsepower is usually consumed in driving tapping attachments. In addition these are generally limited to ¾-in. and smaller sizes.



Operator pulls feed lever down until tap bites work. Tap acts as lead screw and draws itself down until stop wheel hits limit switch. Motor reverses and tap backs out until bracket hits other limit switch. Motor reverses again and drill press is ready for the next part.

To convert your drill press to a tapping machine you will need a motor capable of being operated in either direction, a reversing magnetic starter, two limit switches and a control station consisting of an "emergency stop" pushbutton and a three-position selector switch marked "drill-off-tap."

Attached either to the drill press depth stop or the quill itself, a tripper arm bracket is used to actuate limit switches at the top and bottom of spindle travel. The bracket supports a threaded rod and a stop wheel on the rod is set for the depth of the thread.

Any 3-phase motor may be wired for reversing service. Standard motors may be used for regular production tapping on jobs where the motor is not required to reverse very frequently. On jobs with high production rates, a heavy duty motor

(Continued on page 58)

Structural Adhesive Bonding Salvages Aluminum Tooling Metal

STRUCTURAL metal-to-metal adhesives are being used by Ryan Aeronautical Company, San Diego, California, to salvage once-discarded scrap tooling metal. Savings in tooling costs are reported to exceed $20,000 a year.

Company engineers conceived the idea of building tooling molds in much the same procedure that wood blocks are glued together to build up a forming block. However, instead of wood blocks, scrap pieces of cast aluminum tooling metal were bonded together with Narmco Metlbond 4041.

Metal surfaces are cleaned with a methylethyl-ketone wipe followed by an alkaline cleansing and a water rinse. After drying, facing surfaces are primed with Metlbond 4041, type 11 to 0.0005-in. thickness and dry at room temperature for 60 minutes. Metlbond tape is placed between facing surfaces and the assembly is subjected to a cure cycle of 350 F at 100 psi for 60 minutes.

One-inch square test blocks of aluminum were bonded together and then pulled apart in a testing machine. Note how the adhesive pulled metal from the faces of both blocks.

Tooling ring, laminated from scrap tooling metal, after machining. Note the adhesive bond line between the metal laminates which holds firm even during heavy machining.

For more facts circle 546 on Reply Card

WRIGHT HOISTS & CRANES

ACCO

FOR LONGER LIFE • EASIER MAINTENANCE
LOWEST FINAL COST

WRIGHT *SPEEDWAYS*

Available with single, 2-speed or variable speeds and with a wide variety of mounting arrangements

2-SPEED *SPEEDWAY* FRAME 1

Capacity ¼-ton to 1 ton. Two-speed, 1800/450 RPM motors permit precise, gentle positioning of work at slow speed... fast lifting and lowering at high speed.

***SPEEDWAY* FRAME 1½**

4-part reeved. Capacity to 2 tons ...relatively slow lifting speeds.

***SPEEDWAY* FRAME 2 FRAME 3**

Capacities—
Frame 2, ½-ton to 6 tons
Frame 3, 4 tons to 10 tons

NEW WRIGHT ELECTRIC CHAIN HOISTS

LIGHT—COMPACT—RUGGED—LOW COST

SINGLE CHAIN

DOUBLE CHAIN

Two capacity ranges as pictured. Single Chain—300 to 2000 lbs. Double Chain—3000 to 4000 lbs.

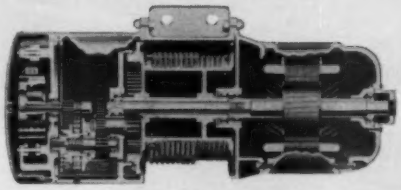
Long Life—Safety—Minimum Maintenance are assured by—

Alloy Steel Load Chain wick-oiled for longest life...heat-treated for long-wearing surface and ductile shock-resistant core—**Load Wheel, Hooks** and **Hook Couplings** drop-forged alloy steel—**Precision Ball Bearings** and **Gears** operate in oil bath—**Double Braking—Fewest Moving Parts.**

These Features make WRIGHT *SPEEDWAYS*

Capacities ¼-ton to 10 tons

your best buy for— MORE PRODUCTION

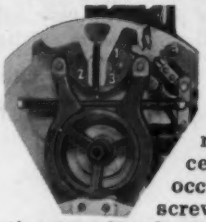


Fine balance and heavy-duty design make possible the continuous handling of tough jobs on any duty cycle for which a 30 minute NEMA motor is satisfactory. All gears and pinions are alloy steel, heat-treated. Their ductile core is shock resistant to severe service stresses. Anti-friction bearings throughout.

LONGER LIFE

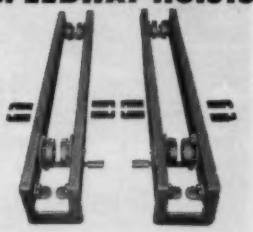
Strength of gear teeth of WRIGHT Frame 2 and Frame 3 *Speedway* Hoists has been doubled by a change in contour and grain structure of the metal. Internal gear ring with heavy flange cross section is bolted to drum at six points and provides extreme resistance to distortion.

EASIER MAINTENANCE



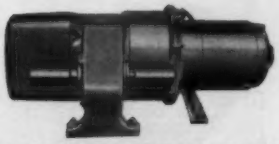
There is *"Nothing to Adjust but the Cam"* to keep the motor brake in perfect adjustment. When excessive load drift occurs...remove the screw shown at Position 1, swing the cam until Position 2 is in line and replace the screw. Position 3 is provided for the final one-third of brake lining wear. Brake springs and solenoid never need adjustment!

Build Better Cranes Save Money too! with WRIGHT END TRUCKS CRANE DRIVE UNITS *SPEEDWAY* HOISTS



WRIGHT END TRUCKS

For motor-driven cranes and hand traveling cranes—both top-running and under-hung types. Timken Bearings throughout. Wide range of capacities up to 10 tons. Structural steel construction is lighter and stronger than cast frames.



WRIGHT CRANE DRIVE UNIT

For crane and double-beam trolley propulsion. Electric motor transmits power through fluid drive to well-proportioned gear reduction. Units are equipped with WRIGHT-designed solenoid "drag" brake. Size 1 Drive Unit has motors up to 2 HP...Size 2 has motors 3 HP to 7½ HP.

For Complete Information *Write for these Booklets—*

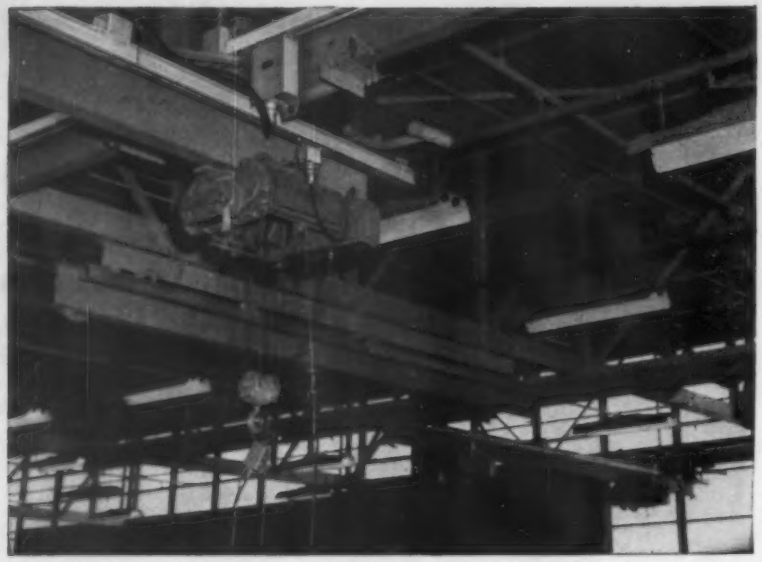
DH-73A • New Electric Chain Hoist
DH-133D • Frame 1 *Speedways*
E-58 • Frame 2 & 3 *Speedways*

Motor Driven Cranes
DH-227 • Underhung, Single Bridge
DH-448A & DH-449A • Top-Running
DH-431C • Crane Drive Units

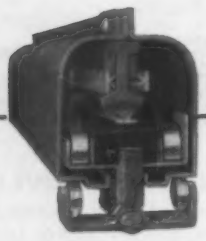
Wright Hoist Division
AMERICAN CHAIN & CABLE

York, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

4 EQUALLY GOOD REASONS



...why your cranes and hoists should be FEEDRAIL® powered



Throughout industry, flexible Feedrail systems, in capacities from 60 to 500 amperes, provide convenient movable power sources for:

- Cranes and Hoists
- Production Lines
- Conveyor Assembly Lines
- Moving Test Lines
- Portable Tools
- Machine Tools
- Cutting and Sewing Rooms
- Lighting
- Motor Control

1. Safe electrification. Feedrail conductors are protectively enclosed in steel – no exposed wiring, no trailing cables. You enjoy maximum protection for personnel and equipment.

2. Minimum maintenance. Elimination of frayed, sagging, broken wires means safer, less frequent maintenance.

3. Better materials handling. There are no time consuming traffic holdups with Feedrail. Fewer accidents, less maintenance mean absolutely minimum down time – more efficient materials handling.

4. Lower operating costs. Elimination of hazardous, wasteful working conditions not only leads to better performance but improves safety records and plant morale as well – eventually lowers insurance costs too.

A Feedrail "moving power system" will fit your crane or hoist's needs – can be installed quickly and easily. Get full information. Write today to Dept. P2.

SOLD BY MORE THAN 1,000 ELECTRICAL DISTRIBUTORS FROM COAST TO COAST

CH7

ELECTRIC FEEDRAIL® *Never Becomes Obsolete*

FEEDRAIL CORPORATION

Subsidiary of Russell & Stoll Company, Inc.

125 BARCLAY STREET • NEW YORK 7, N. Y.

SPECIALLY QUALIFIED REPRESENTATIVES IN PRINCIPAL CITIES

For more facts circle 547 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 54)

with Class B insulation should be used. Motors of this type will withstand 50 or more reversals per minute.

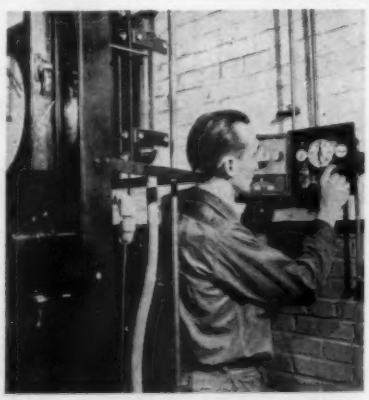
Several firms make kits that include all materials required to convert a drill press to a tapping machine. These firms include Commander Manufacturing Corporation, Renco-Aire, a division of Cleveland Pneumatic Industries, and Beckett-Harcum Company, Inc.

According to Mr. Ben Eldridge, Metalworking Products Manager, Delta Power Tool Division, Rockwell Manufacturing Company, direct tapping has many advantages. Equipment costs are one-fourth to one-half as much as that of a machine designed for tapping and no special skill is required to operate the machine.

The tap provides its own lead and practically no thrust is transferred from the machine to the tap. The threads produced have maximum fidelity to the tap used and this is particularly important in lighter materials such as aluminum, magnesium or plastics.

Control Improves Steam Regulation

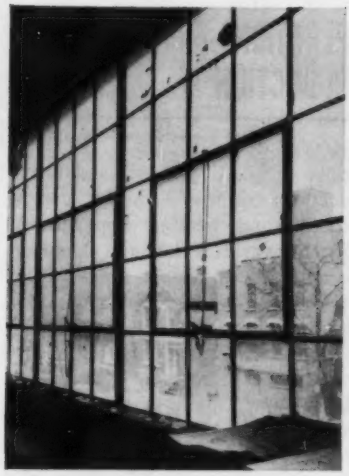
DESIGNED for steam pressure reducing service, automatic controls recently installed at Triangle Pub-



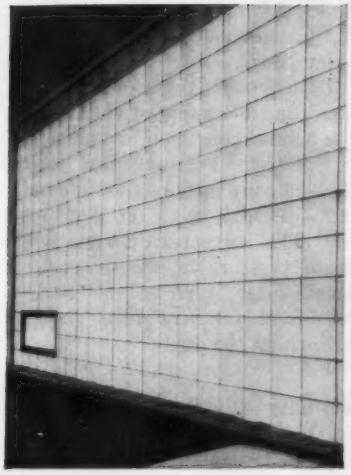
Operator makes control adjustment on automatic pressure reducing system.

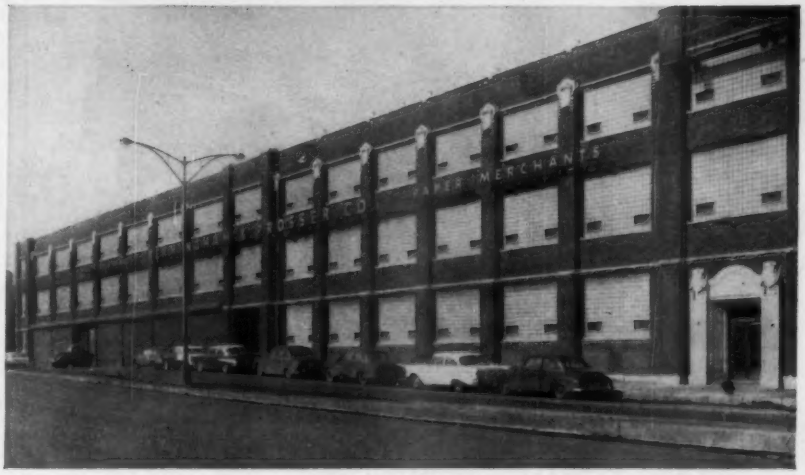
lications, Inc., Philadelphia, Pa., have improved regulation with savings in cost of steam.

Steam is purchased from the local



BEFORE ▲ AFTER ▼





SOLVED—FOUR MAJOR WINDOW PROBLEMS

Are your window areas an eyesore? Do they leak dust and dirt; let in too much summer heat; drain heating system efficiency in winter? Do they create glare that cause workers discomfort and inefficiency? Does constant window maintenance put a dent in your budget?

Bermingham and Prosser Company, Chicago paper merchants, faced those four window problems when they converted a 141,000 sq. ft. grocery warehouse to their own paper storage and distribution operations. Vice President E. L. Todd reports: "We solved all our window problems by installing attractive panels of PC Suntrol® Glass Blocks."

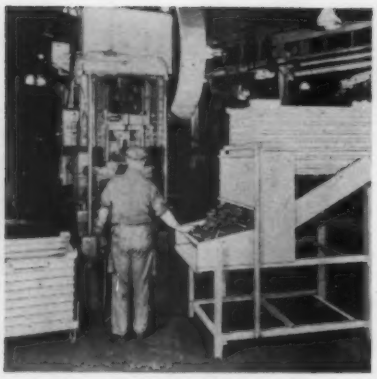
Mr. Todd continues, "The clean, handsome panels made a vast improvement in the appearance of our building. Dust and dirt can't get through. The light diffusing action of the blocks eliminates harsh daylight glare. And the hollow construction of each block gives us good insulating efficiency.

"Expensive maintenance is a thing of the past. No more rusted out sash to be replaced. No more window pane breakage. No more constant window washing."

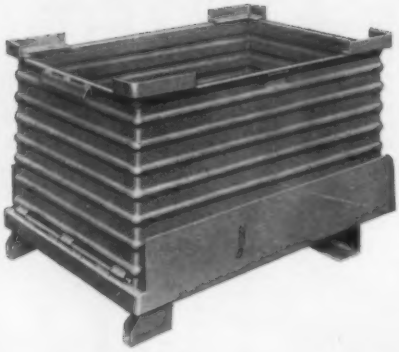
Solve *your* window area problems with PC Glass Blocks. Get full details in our new General Catalog. It discusses our standard line of Glass Blocks, and the new size unit—the 4 x 12. Get your copy by writing Pittsburgh Corning Corporation, Department PG-29, One Gateway Center, Pittsburgh 22, Pennsylvania. In Canada: 3333 Cavendish Boulevard, Montreal, P. Q.

PITTSBURGH PC CORNING

For more facts circle 548 on Reply Card



Plants everywhere report big savings with



WORK-O-MATIC BOXES!

Look at these material handling features...

- **UNIT LOADS**...Transfer, storage, stacking, with fork trucks, just like regular skid boxes.
- **PRODUCTION**...Used with Work-O-Matic positioning stand for automatic work-level material flow. Eliminates tiring waste motion. Boosts production.
- **DUMPING**...Drop bottom feature discharges process material or scrap in nothing flat and with perfect spillage-point control!

You need the complete story to appreciate the full extent of savings. They're big! Units come in various types and sizes for different needs. Write to The Union Metal Manufacturing Company, Canton 5, Ohio.

UNION METAL

Material Handling Equipment

For more facts circle 549 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 54)

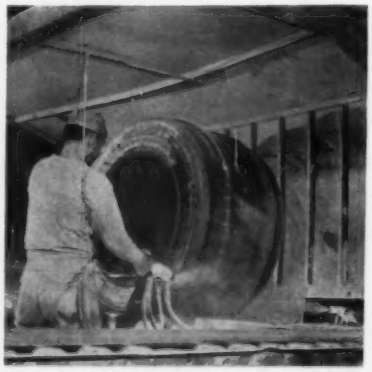
utility at about 150 psi and is reduced to 50 to 70 psi for use in process and heating applications. Demand varies widely and steam requirements can change rapidly from 30,000 lb per hour down to 1000 lb per hour.

The self-operated regulator, formerly used to regulate steam pressure, was located on the line one floor above the control room. When steam flow requirements required a change in controlled pressure, the operator had to go upstairs to reset the regulator or turn a manual bypass valve. Even with these changes, the regulator did not provide accurate control and required frequent maintenance.

To overcome these difficulties, a new control system was installed. The control consists of an indicating U. S. Gauge "Pressure Pilot" which automatically positions a pneumatically-operated valve on the steam line. This inexpensive system holds steam pressure at the desired reduced value, even in the face of large and frequent load changes throughout the day.

Wet Dust Collector Reduces Volatile Hazard

GASOLINE-base lubricants created a volatile dust hazard at the Akron, Ohio plant of the General Tire and



Gasoline vehicle used in spraying lubricants on tires results in dust hazard.

Rubber Company. Lubricants composed of soapstone and mica suspended in gasoline are applied to

HUNT

sets the pace again...

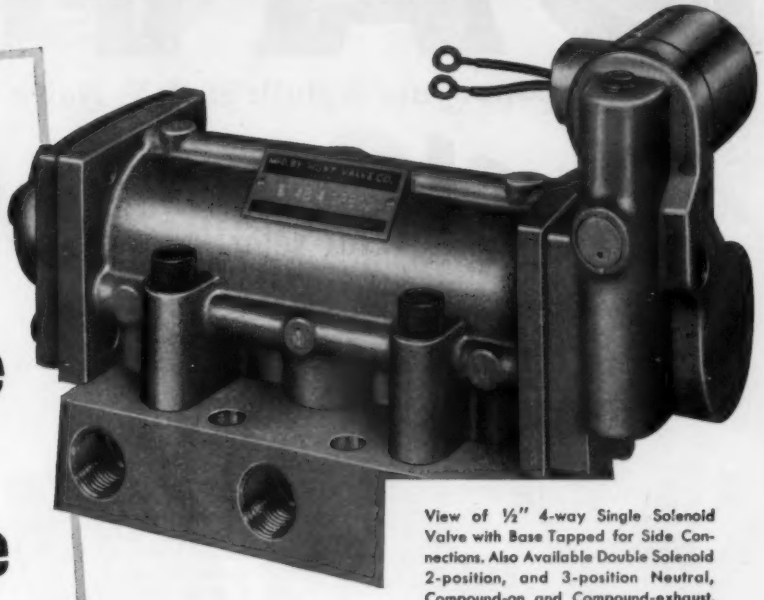
with a

FULL FLOW

½" Valve

at a

½" Price



View of ½" 4-way Single Solenoid Valve with Base Tapped for Side Connections. Also Available Double Solenoid 2-position, and 3-position Neutral, Compound-on and Compound-exhaust.

. . . in a completely comprehensive range of valve actions

THE UNIVERSAL SIZE. We asked O.E.M. buyers, large and small users; men out in the plant and plant managers,—"If you had to standardize on just one size of control valve, what size would you select?" Almost without exception they replied;—"½" size, it meets 85% or more of our requirements".

UNTIL NOW buyers have had to choose between a ⅜" valve tapped ½" but with **only ⅜" flow** (about 167 CFM); or, a ¾" valve tapped ½" but **selling at the ¾" price.**

AGAIN HUNT LEADS. Now, from Hunt, you can get a **full flow ½" valve** (257 CFM at 100 psig) in a complete range of actions, 2-way, 3-way, 4-way and 5-way, including single and double solenoid in AC or DC, any voltage, any cycle, explosion proof solenoid if desired; also hand lever, double pilot, pilot operated automatic return, and mechanically operated both directions, or with automatic return.

GET FULL DETAILS NOW about these new Hunt Valves that give you the flow you need, in the action you want, **at a ½" rather than ¾" price.**

More startling HUNT designs to come!

Send for Bulletin No. 582-A TODAY!

40 YEARS 1919 1959

HUNT

Quick-As-Wink® AIR AND HYDRAULIC CONTROL Valves

Manufactured by HUNT VALVE COMPANY, 2083 East Pershing St., Salem Ohio

For more facts circle 550 on Reply Card

DAY

Pneumatic Conveying & Bulk Storage News

FREE! 2 valuable guides for selecting PNEUMATIC CONVEYING and BULK STORAGE TANKS

BULLETIN M-588—12 page DAY pneumatic conveying guide just off the press. Discusses types of systems, illustrates and diagrams high and low density arrangements, shows equipment and tells "why" and "wherefore" of all types of pneumatic conveying including so-called fluidizing systems.

BULLETIN 574—12 pages, describes horizontal and vertical storage tanks. Points out savings and is filled with photos of various installations plus description of auxiliary equipment.

Whatever your pneumatic conveying or bulk storage problem, look first in these DAY bulletins. They are valuable aids in selecting and ordering the right equipment for your plant. For your free copies use reader service card of this magazine or write direct toDAY.

The **DAY** *Company*

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Minneapolis 13, Minnesota

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Representatives in Principal Cities

EQUIPMENT ONLY OR A COMPLETE SYSTEM

For more facts circle 551 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 54)

the tires to prevent sticking when the tire is placed in the mold to be vulcanized.

Effective collecting of gasoline-laden dust has been accomplished by the installation of a self-contained wet dust collector. The Pangborn collector is operated under a suction by an exhauster which produces a negative pressure in the inlet chamber.

As the dust-laden air enters the collector, it is suddenly expanded, after passing through a bank of four venturi tubes, with a resultant loss of velocity. Heavier dust particles drop into water and sink to the bottom as sludge.

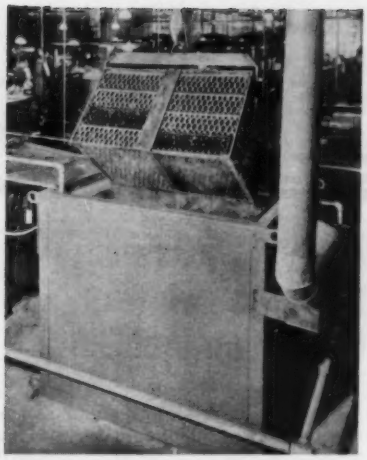
Sludge deposited on the impingement surfaces of the collector is washed down into a tank and settles to the bottom for removal. A chain conveyor, fitted with angle flights, deposits the sludge into a receptacle for salvage or discard.

X-Rays Maintain Steel Quality

X-rays are used at Wallingford Steel Company, Connecticut, to determine exact chemical makeup of each coil of steel or alloy. The Norelco X-ray spectrograph is used to determine percentages of iron, chromium, nickel, manganese, titanium, cobalt, copper and other essential elements except carbon which is checked by combustion methods.

Washer Cleans Blind Holes

WASHING metal chips out of blind holes in various sized die castings is the job of a new washer installed in the Milwaukee plant of Controls



Combining rotary and up and down washing actions, washer removes chips from blind holes in finished castings.

Company of America. The unit cleans finished die castings used for oil and gas controls prior to assembly.

Success of the washer is based on the use of both rotary and up and down washing action. Special detergents are used for washing and the rinsing waters are conditioned with corrosion-resistant ingredients.

Previously used spray-type washers experienced difficulty in removing chips from blind holes and careful inspection of each part was required. Production has increased by reducing the time required to inspect the washed castings.

Lift Table Reduces Fatigue

Positioned by means of foot-operated pushbuttons, a hydraulically-actuated lift table reduces operator fatigue on a sheet shear operation at The Colson Corporation, Elyria, Ohio. Manufactured by the company's Special Products Division in Somerville, Mass., the table is equipped with four independent hydraulic rams with cross-connected stabilizers to assure a level deck.

DAY

DUST CONTROL NEWS

Free! **9** informative

dust control equipment bulletins

You can save time when planning and save money when buying if you'll send for these DAY dust control bulletins. Each contains valuable information about dust control equipment and systems. Here's general information plus useful technical data and specifications. Ask for any bulletin which interests you or write for them all – they're free. Use this magazine's reader service card or write direct toDAY.

BULLETIN G-579 — Describes the DAY Type "RJ" filter. An all purpose, versatile unit. Bulletin gives operating features, dimensions and specifications.

BULLETIN 573 — Dual-Clone dust separators — noted for their low resistance and high cleaning efficiency. Easy to install, no maintenance, no moving parts.

BULLETIN 576 — "HV" heavy duty dust separator. Rugged construction and lower initial cost than many light gauge galvanized type cyclones.

BULLETIN F-75 — Reverse Jet Dust Filter Facts. Complete with specifications, typical equipment layouts, capacity and performance tables for DAY type "AC" filter.

BULLETIN N-578 — Gives complete information about Style "A" rotary valves. Construction features, specifications, dimensions and applications.

"SCHLITZ DEFEATS DUST" — FOOD ENGINEERING magazine reprint describes all out dust control for 3½ million bushel Schlitz grain elevator. Request Bulletin "Schlitz Defeats Dust."

"EFFICIENT DUST SNATCHERS" — Bulletin describes DAY's part in providing maximum safety and good housekeeping for starch packing building of large food processor.

BULLETIN 510 — DAY Unit Dust Collectors. Complete, low cost unit designed for plants or applications where central dust control systems are not practical.

BULLETIN I-585 — Industrial Fans. Complete with helpful selection charts, capacity tables, dimensions and specifications. Information on special types and arrangements included.

The **DAY** *Company*

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Lubrication

SPECIALLY TRAINED OPERATORS now machine "Teflon" to tolerances of .001" with Texaco Cleartex BX.

ANSWER TO "TEFLON" MACHINING PROBLEM FOUND BY THROWING OUT STANDARD CUTTING TECHNIQUES

DuPont's new thermoplastic, "Teflon" (or, more precisely, Polytetrafluoroethylene resin) has a combination of properties which makes it uniquely advantageous in a number of applications.

They also make it uniquely difficult to machine.

Unlike other thermoplastics, "Teflon" does not flow well in its melted state. This, plus the fact that the molding process requires extremely high temperatures, makes molding to close tolerances difficult. "Teflon" must be machined from rod stock when tolerance is a critical factor.

Special machining problems. Standard cutting techniques cannot be applied to "Teflon" machining, according to Mr. S. Mulay, President of Tri-Point Plastics, Inc., Albertson, N. Y. His firm, which specializes in working DuPont's new product, had to invent new cutting techniques and retrain operators to cope with "Teflon's" special characteristics. In spite of these steps, the materials—tools and lubricants—used in the machining process still gave Tri-Point trouble.

Cutting oil a critical factor. It soon became obvious that standard cutting oils used for ordinary metalworking were not adequate for "Teflon" machining. Although "Teflon" is not an abrasive material, its very low thermal conductivity coupled with its high heat resistance tended to shorten tool life by actually burning cutting edges. These high temperatures also warped the machined part, making close tolerances almost impossible. Finally, "Teflon's" white color made it extremely difficult to see the work through soluble oil emulsions—which otherwise might have solved the problem.

Tri-Point calls in Texaco. At this stage Tri-Point turned to the expert – a Texaco Lubrication Engineer. He outlined the need: a transparent cutting oil with the ability to remove the maximum amount of heat. After considerable study and testing, he recommended switching to Cleartex BX whose characteristics seemed precisely to fit the situation. His choice has proved to be right. Now Tri-Point uses this oil exclusively, with excellent results. Tool replacement has dropped significantly, and Tri-Point can count on maintaining "Teflon" tolerances of .001".

Pressure plus heat presents two-way lubrication problem

There is a definitely established trend today toward higher and higher temperatures in industrial processes in almost every type of industry. Mill rolls, plastic extruding machines and steam joints are only a few of the many applications which now involve temperatures well over 300° F. combined with high pressures. This combination has presented a severe lubrication problem – particularly in grease-lubricated equipment.

Nature of grease creates problem. As temperature rises, the consistency of grease decreases – most greases become virtually useless at temperatures above 350°. Furthermore, high heat will usually cause rapid oxidation and deterioration in a relatively short time.

Unique new grease resists both forces. Texaco has now developed a new product whose remarkable performance in two years of field tests seems to answer the problems of *both* high heat *and* extreme pressure—Thermatex EP-1.

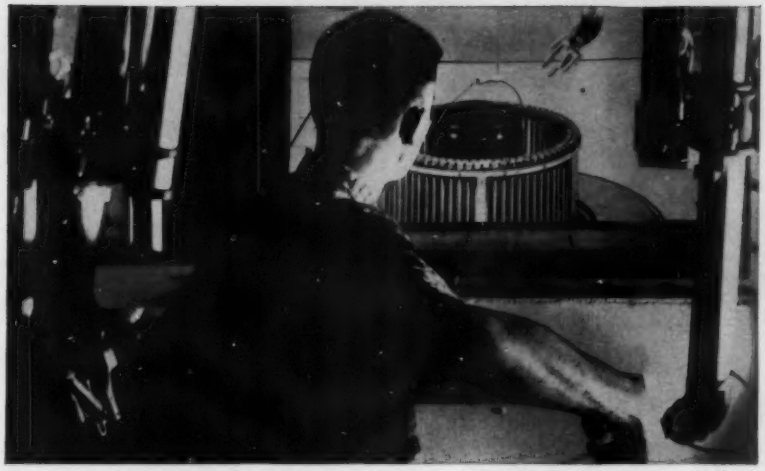
Thermatex is unique in its high resistance to both these forces.

Protects 400° equipment for two years. Thermatex has been field-tested for two years as the lubricant for steam joints in a paper mill. Previous products used had solidified and coked after two weeks of exposure to the extreme pressures and 400° F. heat, causing failure of the joint. Thermatex, on the other hand, has kept the steam joints operating without failures—and without significant wear—for two years.

news

TEXACO

REG. T.M.



GAMMA-RAY "HOT CELL" AT BEACON contains radioactive Cobalt-60.

Nuclear energy harnessed to crack the secret of better lubricants

Lubricants finer than the ones available from even the most advanced standard refining techniques will soon be produced by Texaco—with the help of nuclear radiation. Completely *new* lubricants are a real possibility, too—lubricants with atomic structures stronger and more cohesive than anything now available.

To open up this new frontier in lubrication, Texaco has assembled the most fully equipped nuclear laboratory in American industry. Texaco scientists have been put in command of all four basic irradiation forces—electrons, positive ions, gamma rays and neutrons—and are now probing the activity of hydrocarbon molecules during refining.

In addition to the Cobalt-60—rated at 29,000 curies—Texaco scientists have at their disposal a 6- to 10-million electron volt linear accelerator and a 3-million electron volt positive-ion Van de Graaff generator. The linear accelerator, or "electron gun," was especially designed and built for Texaco and is probably the only nuclear instrument of its kind now in use by a commercial firm for its own fundamental research.

Searching analysis of deposit problems

The January 1959 issue of *Lubrication Magazine* is entirely devoted to deposit problems—their causes, prevention and solutions. This article should be of vital concern to every engineer who has to cope with this often-costly lubrication problem. See coupon.

TUNE IN... Metropolitan Opera Radio Broadcasts Every Saturday Afternoon

MOVIE OF THE MONTH

★★ SEE! ★★

"HYDRAULICS"

"One of the year's most informative movies!"

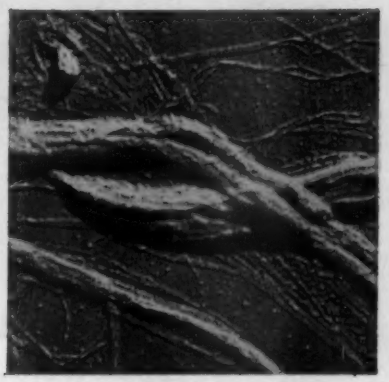
—Paul Rolnick, Editor, *Applied Hydraulics*

For more facts circle 553 on Reply Card

NEW PRODUCT NEWS

Nondrying protective coating keeps parts free from rust and corrosion for as long as a month during inter-process handling, storage, and shipment: *Texaco 564 Rustproof Oil.*

New, easy-to-apply gear lubricants won't drip in hot weather or flake off in cold—are ideal for many open-gear applications: *Texaco Geartac.*

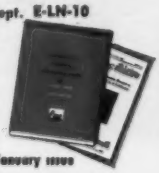


How working splits grease fibers.

80,000x electron microscope explores grease structures

One of the most important tools of research, the electron microscope, is helping in the development of new and better greases. By understanding the nature of grease structures and their reaction to various conditions, Texaco scientists can create greases that are suitable for many different purposes.

THE TEXAS COMPANY, Dept. E-LN-10
135 East 42nd Street
New York 17, New York



Dear Sirs:

☐ I am interested in seeing "HYDRAULICS"

I would like a free copy of

☐ Lubrication Magazine – January issue

☐ Management Practices that Control Costs via Organized Lubrication

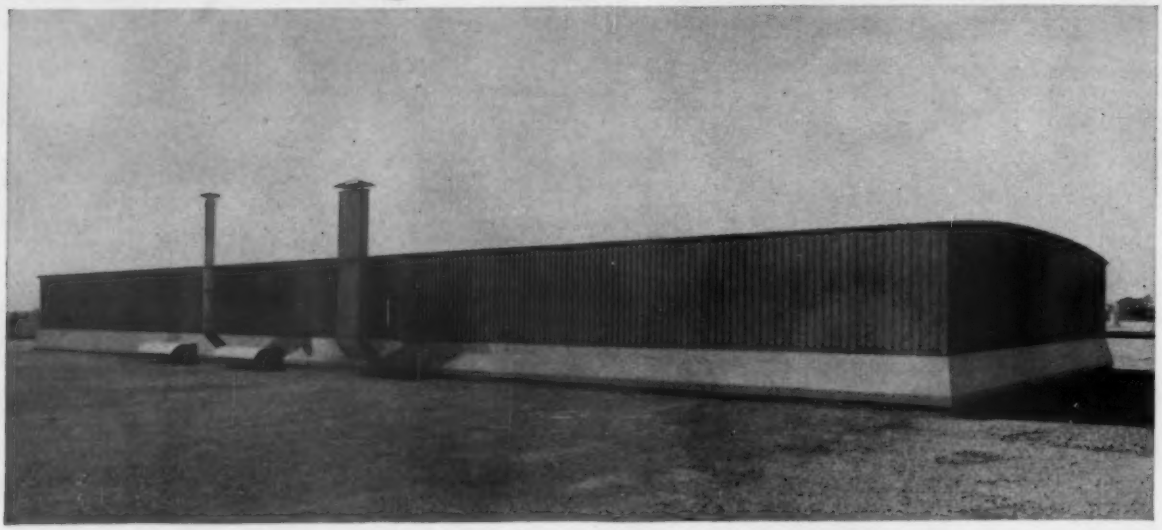
Name_____ Title_____

Firm_____

Address_____

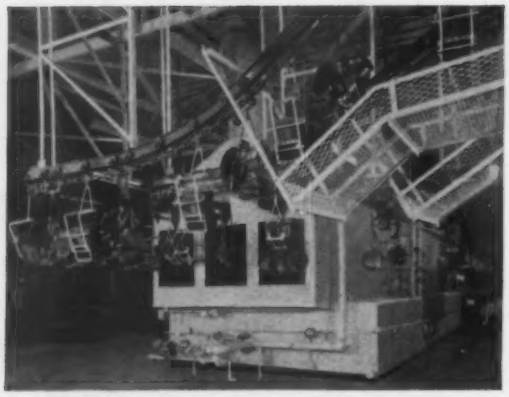
City_____ State_____

Processing EQUIPMENT...



Mahon Dehydrating Oven with Controlled Dew Point Installed on the Roof of the Copeland Plant, Sidney, Ohio.

COMPRESSORS are Dehydrated, Sealed, Inspected, Tested, Painted, and Charged with Refrigerant on ONE CONTINUOUS CONVEYOR PRODUCTION LINE!



Mahon Three Conveyor Line Two-Stage Metal Parts Cleaning Machine—Another Unit of the Compressor Processing Equipment Installed at Copeland Refrigeration Corporation, Sidney, Ohio.

The High Temperature, Low Dew Point Dehydrating Oven illustrated above is part of the modern straight-line production facilities for processing Compressors in the Copeland Refrigeration Corporation's plant, Sidney, Ohio.

When you need Processing Equipment or Special Production Equipment of any kind, you, too, will want to discuss methods, equipment requirements and possible production layouts with Mahon engineers . . . you'll find them better qualified to advise you, and better qualified to do the initial planning and engineering of equipment that will produce the desired end result at minimum cost per unit processed.

THE R. C. MAHON COMPANY • Detroit 34, Michigan

Sales-Engineering Offices in Detroit, New York and Chicago

Engineers and Manufacturers of Complete Conveyorized Finishing Systems: Metal Parts Washers, Metal Cleaning and Rust Proofing Machines, Conveyorized Cleaning and Pickling Machines; Dry-Off Ovens, Spray Booths, Electrostatic Spray Enclosures, Flow Coaters, Dip Coaters, Finish Baking Ovens, and Paint Stripping Equipment; Core Ovens, Soldering Ovens, Dehydrating Ovens, Heat Treating and Quenching Equipment for Aluminum and Magnesium; Dust and Fume Control Installations, and Many Other Units of Special Plant and Production Processing Equipment.

See Sweet's Plant Engineering File for Information and Representative Installations, or Write for Catalogue A-659

. . . the **EXPERIENCE** that goes into the **PLANNING** and **ENGINEERING** of **MAHON EQUIPMENT** is the item of **GREATEST VALUE to YOU!**

MAHON

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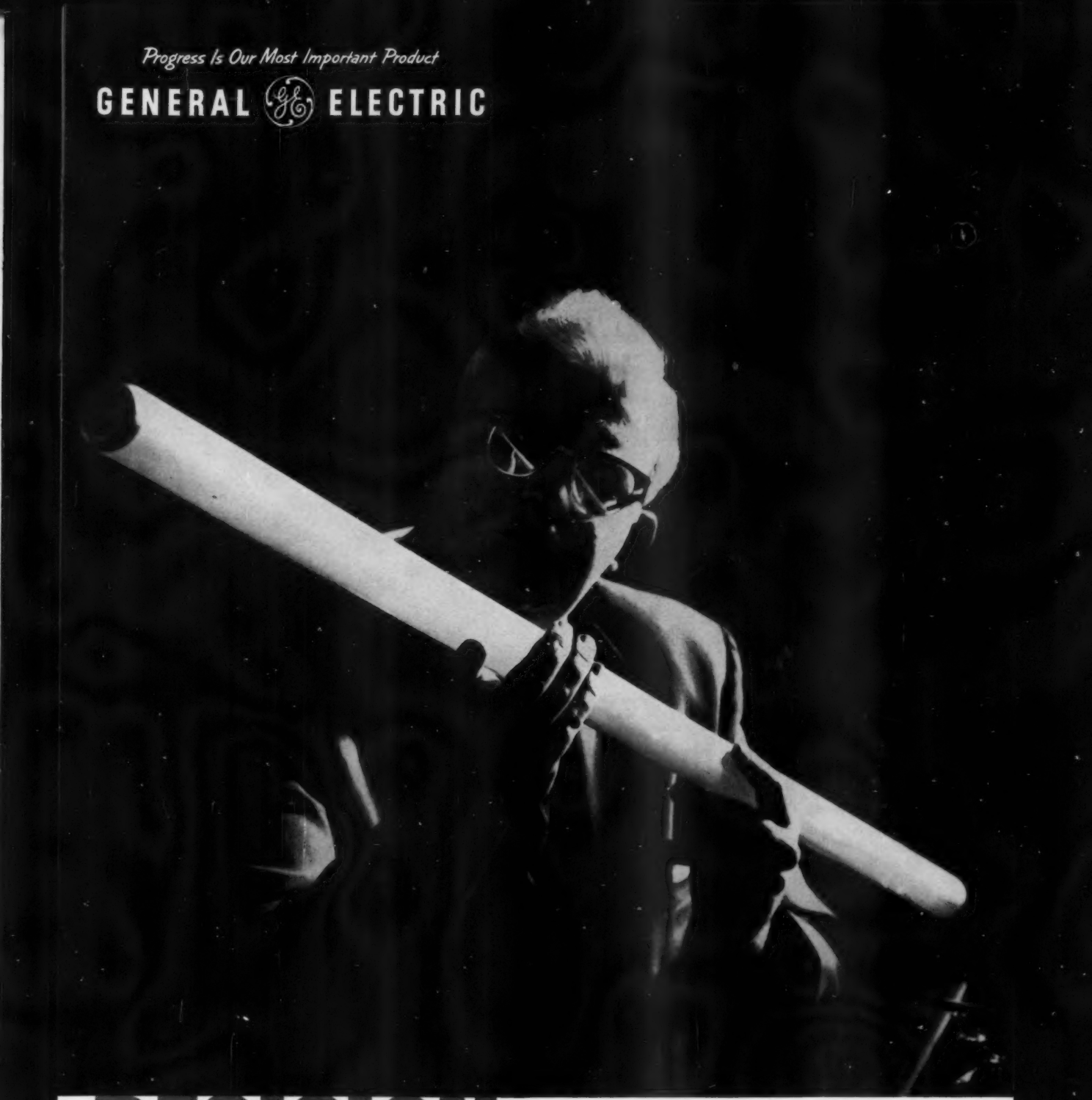
Progress Is Our Most Important Product

GENERAL ELECTRIC



DECISION

"Alone . . . just me and my question . . . which lamps to buy. All look about alike . . . but I keep remembering what past experience has proved to us about General Electric Lamps. That 999 out of 1,000 are sure-starters . . . and 99 out of 100 will still be burning in 1961. And happy thought! We pay less for a case of G-E Fluorescent Lamps today than we did in 1950!"

DECISION: "Why gamble on performance when I can get G-E Lamps at little or no premium in the purchase price."

General Electric Co., Large Lamp Dept. C-905, Nela Park, Cleveland 12, O.

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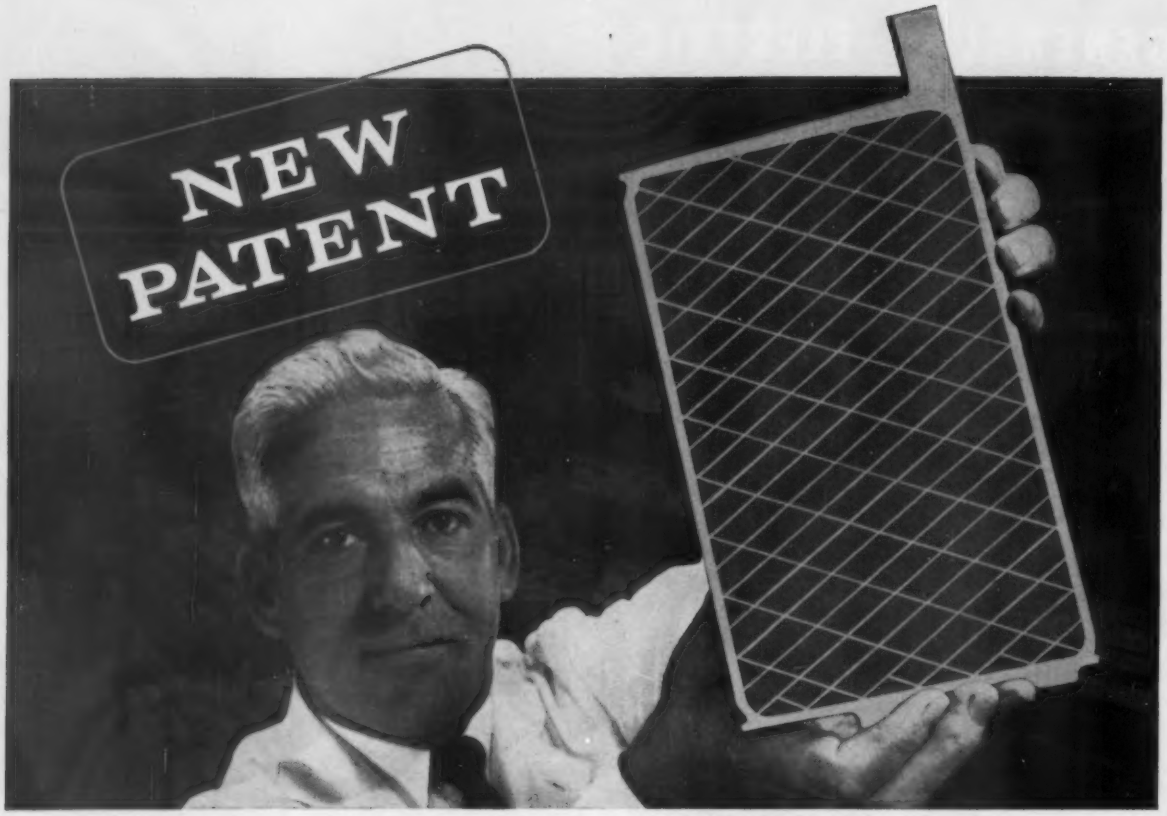


The New *gould* SILCONIC Plate Lengthens Battery Life 10-25%

Two distinct improvements:

1. Gould has developed a new patented (July 1958) process for introducing Silver-Cobalt into the active materials of the positive plates of Motive Power Batteries.

The temporarily soluble silver-cobalt sulphates, when added to the active materials, migrate to all positive grid members.

The Sulphates collect on the grid members to form an insoluble oxide surface or protective sheath which is impervious to acid and oxygen attack.

2. In order to insure a homogeneous grid completely free of flaws, a carefully determined amount of arsenic is added to the regular metal. This produces a smooth flowing metal during the casting operation which results in an extremely dense and uniform grid.

By selectively adding the silver-cobalt and arsenic to the plate, Gould is able to produce the new *SILCONIC* positive plate . . . a Gould exclusive.

Gould Industrial Truck Batteries with Silconic Plates resist corrosion, hold their charge and last longer.

HOLDS CHARGE LONGER. In those applications where batteries are idle for periods of time the *SILCONIC* Plate is ideal. This Silver-Cobalt coating prevents migration of materials to the negative plate, effectively reducing self discharge within the cell.

MIGRATION OF SILVER-COBALT ATOMS. The migration of Silver-Cobalt atoms continues throughout battery life, offering continuous resistance to the corrosive attack of acid and oxygen. This continuous effect is the result of a solid state migration of the Silver-Cobalt which penetrates deeper and deeper into the grid metal during battery operation, thus prolonging the life of the *SILCONIC* Plate.

LONG-FULL SHIFT OPERATION ASSURED. Comparative tests between *SILCONIC* and conventional plates prove that the *SILCONIC* Plate maintains maximum capacity for a considerably greater portion of its service life, retards the tendency toward grid growth, assures longer full shift operation of batteries.

Write for complete data or call your local Gould representative. He's listed under "Batteries Industrial" in the yellow pages. Gould-National Batteries, Inc., Trenton 7, N. J.

More Power to you from Gould

For more facts circle 556 on Reply Card

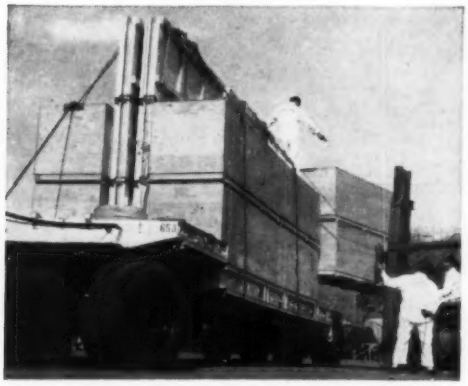
A REPORT TO MANAGEMENT ON HOW

Industry cuts costs with FIR PLYWOOD

ROUTE TO:

- ☐ ENGINEERING
- ☐ PRODUCTION
- ☐ SALES
- ☐ PURCHASING
- ☐ MAINTENANCE
- ☐ CONSTRUCTION
- ☐ _____

Long span, low cost. Sixty foot fir plywood trusses like this helped hold construction costs to $2 per foot on Diamond Lumber Co.'s big Portland, Ore., warehouse. The strength and stiffness of the truss—dramatically demonstrated above—is achieved by stressing the plywood in a curve; the continuous scarf-jointed panel acts as both top chord of truss and roof decking.



Fragile! Package with plywood. Valuable and easily damaged articles like guided missile components (shown here being shipped in special re-usable crates) get better protection with plywood for less than half the cost of other, less rugged packaging materials at Lyon Van & Storage Co.'s California export division. Firm uses 75,000 sq. ft. monthly for packaging of all types.

How to modernize boxcars fast. A new method of stapling fir plywood directly over damaged lumber lining is helping Southern Pacific upgrade B and C cars into Class A carriers in record time. It takes only one-third as long as installing new T&G lumber—and cuts costs in half. Work on 400 cars is being done at SP's West Oakland and Roseville, Calif., yards. Cars are out of service only a short time; labor time averages 8 to 10 man hours per car. The more valuable ladings which can be carried in the upgraded cars is often enough to recover the cost in a single run.

FOR MORE INFORMATION about fir plywood—its uses, properties and advantages—write

DOUGLAS FIR PLYWOOD ASSOCIATION

TACOMA 2, WASHINGTON

—an industry-wide organization devoted to research, promotion and quality control

DFPA TESTED QUALITY

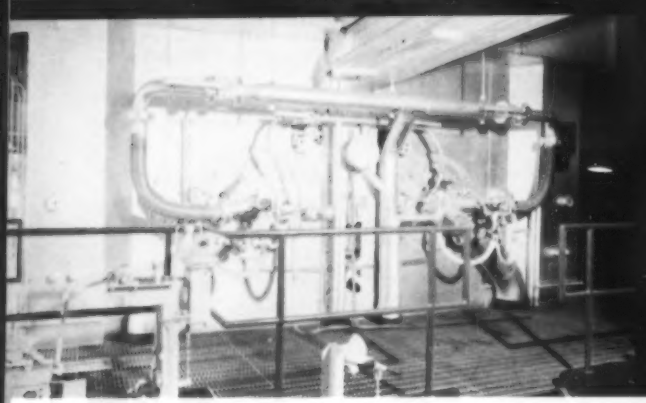
Always specify by DFPA grade-trademarks

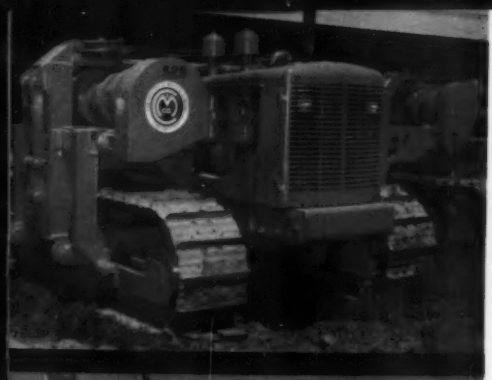
For more facts circle 557 on Reply Card

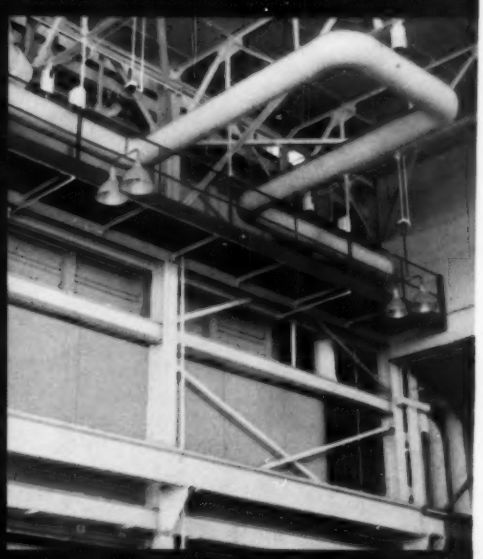
For more facts circle 558 on Reply Card →

Bright, modern, functional

COLORS







...another important **Difference** in the Rust-Oleum System

How many coating manufacturers offer you a *complete system* that Stops Rust—and provides lasting beauty over the years? The Rust-Oleum *System* does just that.

First—apply Rust-Oleum 769 Damp-Proof Red Primer directly over the sound rusted surface, after scraping and wirebrushing to remove rust scale and loose rust. The *specially-processed* fish oil vehicle in the primer penetrates rust to bare metal—merging the rust into the coating—saving costly surface preparations. *Second*—the wide variety of colors in Rust-Oleum finish coatings provides lasting beauty over the primer. Your choice of practically all colors from bright enamels to soft, restful pastels—all formulated for long over-the-years protection.

What is your coating problem? From Heat Resistant, Chemical Resistant, and Machinery Finishes to Heavy-Duty Top Coatings for use indoors and out—Rust-Oleum has the coating to meet your needs and the *system* for lasting beauty. Consult your Rust-Oleum Industrial Distributor . . . he has complete stocks for your use in maintenance, new construction, and remodeling. His experience can serve you well.

A matter of excellence.
Distinctive as your own fingerprint.

RUST-OLEUM®

STOPS RUST!®

RUST-OLEUM IS AVAILABLE IN PRACTICALLY ALL COLORS

SEE OUR CATALOG IN SWEET'S
OR WRITE FOR COPY

STOP RUST

with
RUST-OLEUM
769 Damp-Proof Red Primer

Eliminate costly surface preparations and save time, money, and metal. Just brush Rust-Oleum 769 Damp-Proof Red Primer right over the sound rusted surface—after scraping and wirebrushing to remove rust scale and loose rust. You can do this because the **specially processed fish oil vehicle** penetrates rust to bare metal—as proved by radioactive tracing studies.

SEND FOR FREE TEST SAMPLE! ATTACH TO YOUR LETTERHEAD!

Rust-Oleum Corporation
2982 Oakton Street, Evanston, Illinois

Please send me the following at no cost or obligation:

- ☐ Free test sample of Rust-Oleum 769 Damp-Proof Red Primer for rusted metal surfaces.
- ☐ Complete literature with applications and color charts.
- ☐ Information on matching special colors.
- ☐ Thirty-page report on Rust-Oleum fish oil penetration.

"...our instruments like Honeywell accessories, too!"

INSTRUMENTS "know" the difference. They do their best with accessories designed for them by an instrument manufacturer.

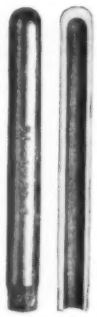
It takes an instrument man to make the perfect match between instruments and accessories. Your Honeywell instrument sales engineer knows your process and its controls, and which accessories are best suited to both. He can choose from a broad line of charts, inks, thermocouple wire, wells and protecting tubes.

Additional advantages gained from buying Honeywell accessories are convenience, economy and single-source purchasing. No shopping around. No need to "mix breeds." And you can be sure that whatever you buy will be right for the job. Your Honeywell instrument sales engineer will see to that. Call him today . . . he's as near as your phone.

MINNEAPOLIS-HONEYWELL, Wayne and Windrim Avenues, Philadelphia 44, Pa.

Here's one product from the complete Honeywell accessories line:

CAST IRON T/C PROTECTING TUBES



This is one of the protecting tubes recommended for use with molten aluminum or die casting applications. It can be used at maximum temperatures of 1300° F. in oxidizing atmospheres, and 1600° F. in reducing atmospheres. Available in standard lengths of 12, 18, 24, 30 and 36 inches.

All Honeywell cast iron protecting tubes are Beta-gage checked for uniform concentricity . . . assuring maximum life.

Honeywell

H HONEYWELL *First in Control*

MINIMUM MAINTENANCE, LONG LIFE ASSURED BY THESE HEAVY-DUTY "BUFFALO" FANS

"Buffalo" Type "BLH" Fan
For Classes III & IV Service

"Buffalo" Type "BL" Fan
For Classes I & II Service

The high performance characteristics of these two outstanding "Buffalo" Fans has resulted in their widespread use in the field of industrial air handling. In addition to offering peak-efficiency operation in their respective classes, both the "BL" and the "BLH" bring you a bonus economy factor of *maintenance reduced to an absolute minimum* throughout a long, productive life. This minimum maintenance factor is directly due to unusually rugged "Buffalo" construction features such as:

HOUSINGS — The heavy gauge sides and scroll are of all-welded construction. Heavy structural steel bracing provides housing stiffness and rigid bearing support. Flanged inlets and outlets give added support.

SHAFTS — Hot-rolled or forged shafts are ground to close tolerances for perfect wheel and bearing fit.

WHEELS — Sturdy backward-curved blades are welded to the die-formed shroud and welded or riveted to the solid backplate. Heavy hubs assure permanent shaft alignment. For higher tip speeds, reinforcing rings provide necessary wheel rigidity.

BEARINGS — Self-aligning anti-friction bearings are designed for continuous operation at maximum tip speed. Horizontally split, ring-oiled, self-aligning, babbitted sleeve bearings are also available.

For full details, contact your "Buffalo" representative, or write for Bulletins F-102 and F-200.

Minimum maintenance is assured by the famous "Q" Factor — the built-in QUALITY that provides trouble-free satisfaction and long life in every "Buffalo" product.

"Buffalo"

BUFFALO FORGE COMPANY

166 Mortimer Street • Buffalo, N. Y.

BUFFALO PUMPS DIVISION, BUFFALO, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING

For more facts circle 560 on Reply Card

How to get a "custom" pump at a standard price

Here's a new line of vertical centrifugal pumps easily tailored to your exact needs.

For process transfer or heavy-duty sump service, these pumps have features which assure long trouble free life with a minimum of maintenance.

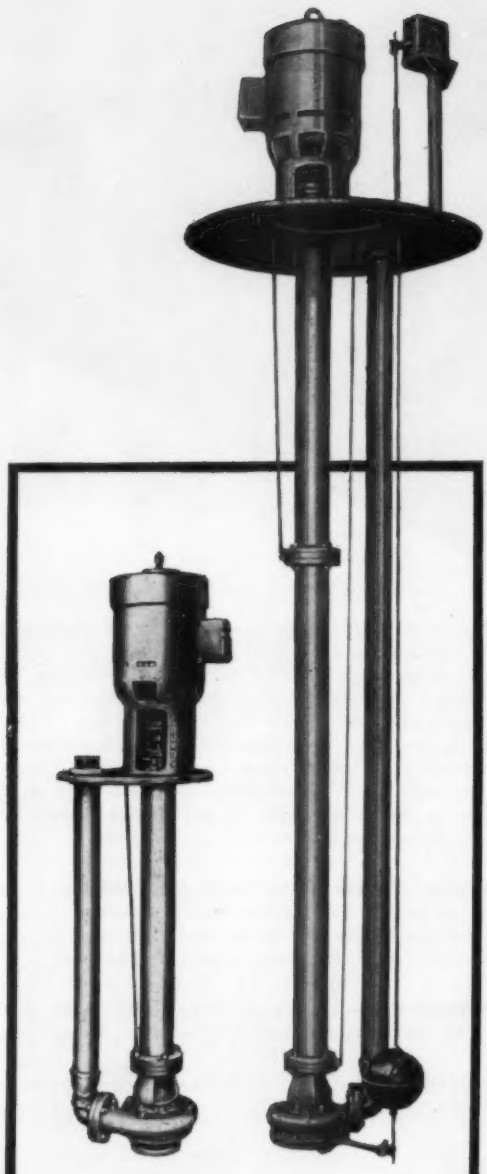
Because they're built from standard parts, delivery is fast and there is no premium charge for custom building. When you want to change pit depth or pump ratings, you merely replace necessary parts. Units may be adapted in the field. Shafts and pipe columns are available for any pump length from 2 to 20 ft. in 6-inch increments.

There are types for wet or dry pits, with capacities to 1080 GPM or heads to 290 ft. Vaporproof construction is available.

Complete details in Bulletin 726.2.

GOULDS PUMPS, Inc., Dept. PE-2, Seneca Falls, N.Y.
Main Office and Works

Branches and Representatives in all principal cities



Goulds Fig. 3173 Goulds Fig. 3171

GOULDS

PUMPS FOR INDUSTRY

For more facts circle 561 on Reply Card

For more facts circle 562 on Reply Card

Many tests are made to compare various conduits under different exposure conditions. One of the most severe is the sulfuric acid test. Immerged into a 7½% solution of sulfuric acid, the zinc protection on ordinary brands of conduit fails in less than 6 hours, while the MVC-1 coating on SHERARDUCT stands up for 72 hours and longer. Other accelerated tests—salt spray, caustic soda, etc.—do not affect the MVC-1 polyvinyl coating.

HOT ZINC COATED

SHERARDUCT with MVC-1

provides permanent protection of electrical wiring

Even under the most severe service conditions, hot zinc coated SHERARDUCT with MVC-1 gives lifetime protection of wiring. MVC-1—the baked-on polyvinyl chloride resin coating—is an exclusive National Electric development. It resists all types of corrosion. On top of the hot zinc coating of SHERARDUCT, MVC-1 adds years to the service life of your conduit system . . . even in extreme service exposure conditions.

In addition to its exceptionally high corrosion resistant properties, MVC-1 is exceptionally resistant to abrasion, and it is not adversely affected by high or low temperatures. Once installed, hot zinc coated SHERARDUCT with MVC-1 is there to stay.

SHERARDUCT also gives you time-saving and money-saving benefits on the job. The slow heating-cooling "normalizing" process gives SHERARDUCT easy-to-bend properties, easy to cut and re-thread in the field—no cracking, no flaking of the finish. Besides, the smooth inside surface of the polyvinyl coating makes fishing easier and faster . . . provides protection against corrosion for the interior of SHERARDUCT.

Added together, these benefits mean hot zinc coated SHERARDUCT with MVC-1 provides top money value . . . in ease of installation . . . in years of protection. Why take less, when with SHERARDUCT you get the best. VMA-6303

National Electric Products Corp.

In Canada: NEPCO of Canada, Ltd.

PITTSBURGH 22, PENNSYLVANIA

SALES OFFICES LISTED UNDER

Bennett Associates, Inc.

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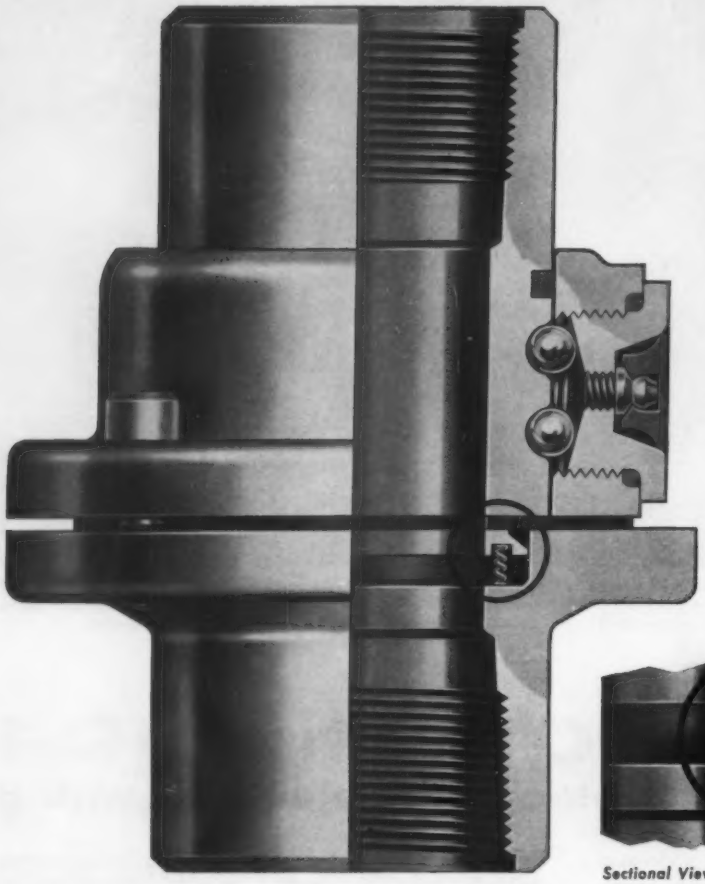
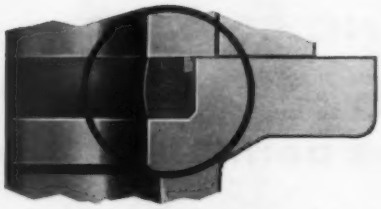
The NEPCO quality family provides dependable, permanent, maintenance-free electrical systems

For Trouble-Free Flexibility on Steam, Hot Gas, Chemical Service Lines

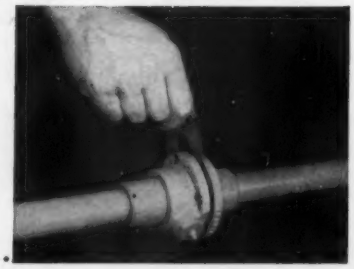


For the engineer concerned with flex or rotational problems, on lines handling steam, hot gas or chemicals, the new DS swivel joints present a quick, effective solution. Versatile packing design permits use of either disc or molded types of packing to meet a wide number of services. Split segments allow replacement of packings within minutes and without removing joint from the line. And within the eight basic configurations of the new DS series joint are models to provide full 360° rotation in one, two or three planes. DS series swivel joints are recommended for chemical services ranging from −40° to +400°F and 300 psi. In steam rotation, the maximum is 440°F at 360 psi. For complete details on this remarkable series of Chiksan swivel joints, write today for your copy of Bulletin 1258.



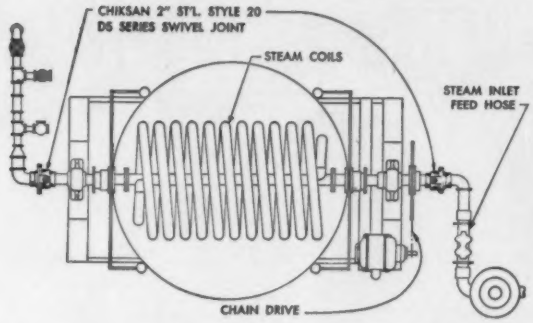
Sectional View showing typical molded packing installed

NEW *CHIKSAN* DS



REPLACE SEALS WITH SWIVEL JOINT IN LINE

Allen-type screws secure the two sections of the DS series swivel joint. Screws are readily removed and seals replaced with joint in the line.

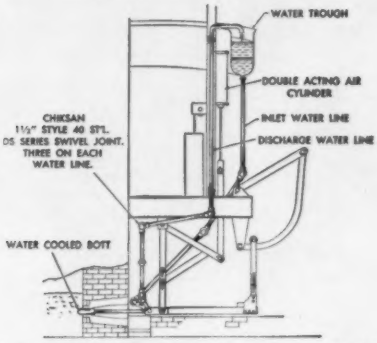


ROTATING STEAM COIL IMPROVES COOKING QUALITY, CUTS COSTS

For more details, request application report .009

Stationary steam coils in a large food processing plant were accumulating burned scale, reducing heat transfer by as much as 20% in a relatively short time.

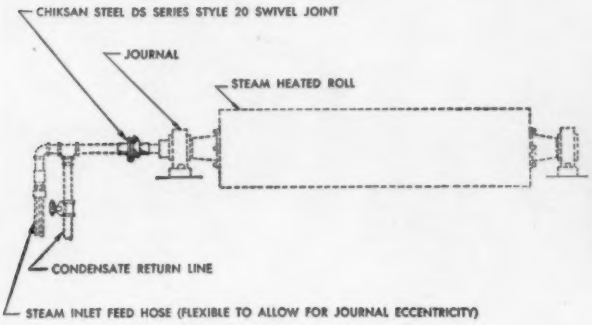
Using Chiksan DS series swivel joints, the plant engineer designed a self-scouring rotating coil. Net results, this plant now gets closer flavor and quality control—also sustains heat-exchange efficiency—thus saving fuel.


WATER TROUGH
DOUBLE ACTING AIR CYLINDER
CHIKSAN 1½" STYLE 40 ST'L. DS SERIES SWIVEL JOINT. THREE ON EACH WATER LINE.
INLET WATER LINE
DISCHARGE WATER LINE
WATER COOLED BOTT

SWIVEL JOINTS HELP PULL THE PLUG ON MOLTEN SLAG

For more details, request application report .014

Pulling the water cooled bott permits removal of molten slag from blast furnaces. Proximity to the intense heat made rubber hoses out of the question. And even ordinary swivel joints weren't faring too well because packings would bake out in a day or two. New Chiksan DS series swivel joints deliver the solution, providing ten to twelve weeks of service before packing replacement is required.


CHIKSAN STEEL DS SERIES STYLE 20 SWIVEL JOINT
JOURNAL
STEAM HEATED ROLL
CONDENSATE RETURN LINE
STEAM INLET FEED HOSE (FLEXIBLE TO ALLOW FOR JOURNAL ECCENTRICITY)

STEAM STAYS ON THE BEAM WITH CHIKSAN SWIVEL JOINTS

For more details, request application report .004

To emboss plastic sheets, the material must be heated to a just-right degree of softness. A steam leak at the swivel joint connecting the stationary steam pipe to the revolving inlet means serious trouble. Previous tried devices were unsatisfactory. A DS series swivel joint was recommended. Present joint has been in service for better than four months with superior results. And when packing fatigue does occur, it can be quickly replaced with a minimum down time.

SWIVEL JOINTS
SERIES

CHIKSAN COMPANY, 330 North Pomona Avenue, Brea, California
Please send me copy of Bulletin 1258.
Please send me product application report .004 ☐ .009 ☐ .014 ☐

Name_____

Company_____ Title_____

Address_____

City_____ Zone_____ State_____

CHIKSAN fmc

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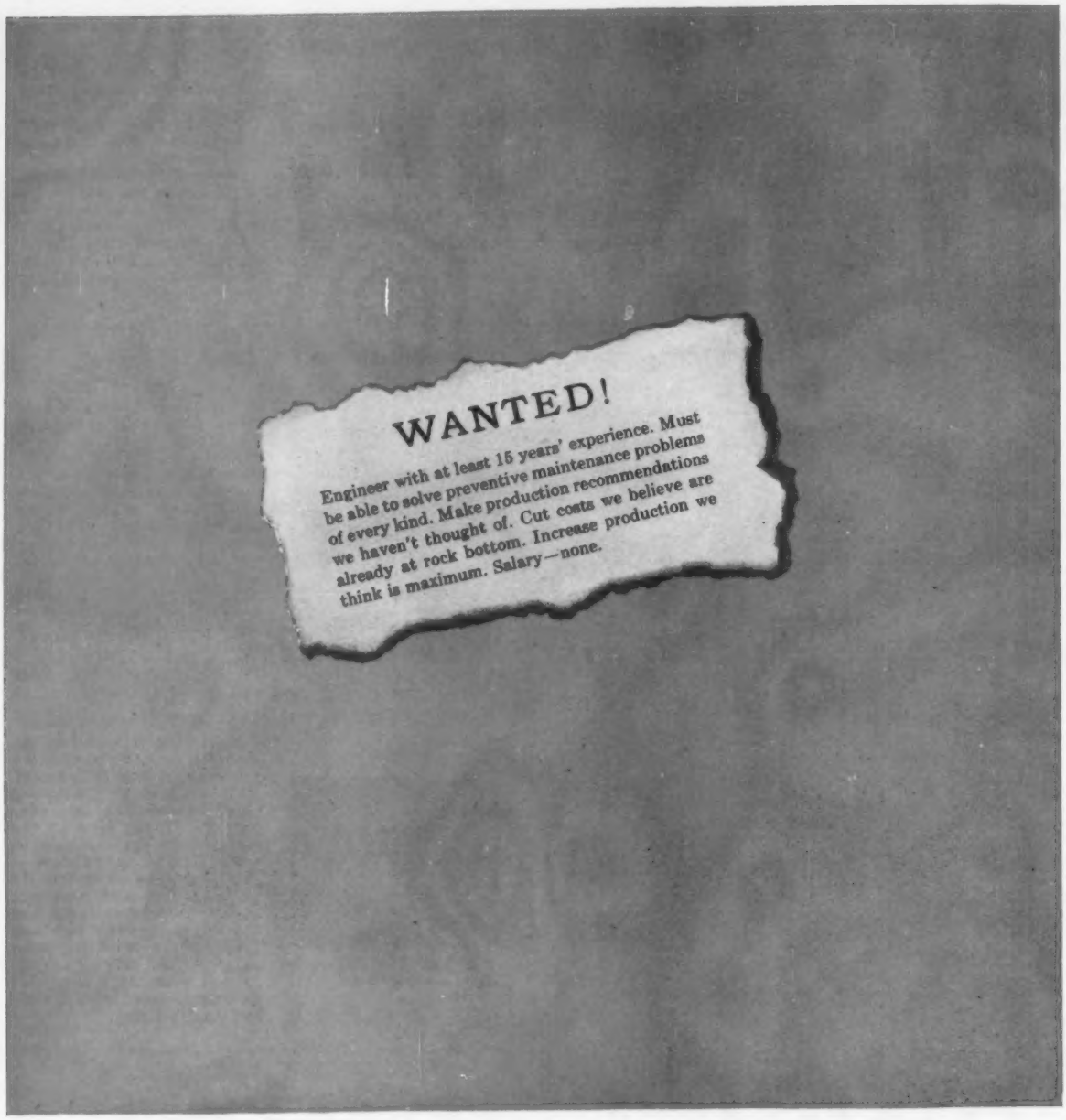
For more facts circle 563 on Reply Card


WANTED!
Engineer with at least 15 years' experience. Must be able to solve preventive maintenance problems of every kind. Make production recommendations we haven't thought of. Cut costs we believe are already at rock bottom. Increase production we think is maximum. Salary—none.

Mobil has the man . . . he's at your service!

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For more facts circle 564 on Reply Card

CONSTRUCTION BRIEFS —a review of fundamentals for the plant engineer

Prepared by B. A. Wasil, Structural Engineer

DESIGN OF REINFORCED CONCRETE COLUMNS I—AXIALLY LOADED

REINFORCED CONCRETE columns are ordinarily one of two basic types:

1. Spirally-reinforced column—a circular, square or sometimes rectangular column, with vertical steel arranged on the periphery of a circle. The vertical rods are wrapped spirally by a wire from support to support.

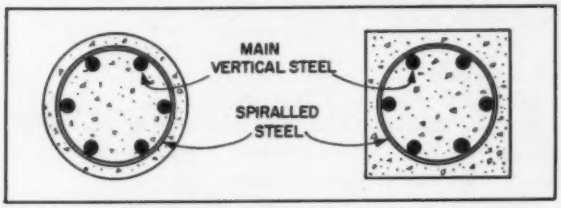


Fig. 1. Cross-sections of typical spirally-reinforced columns.

2. Tied column—square or rectangular in shape. There are at least four vertical bars, with one in each corner of the cross-section. Additional vertical bars are placed on the sides of the column. All vertical bars must be held in place by horizontal ties.

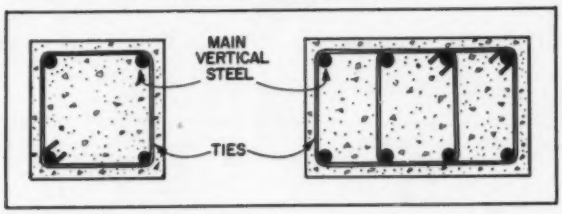


Fig. 2. Cross-sections of columns with tied reinforcing bars.

It was recognized early in the history of reinforced concrete design that because a column is subjected to a large percentage of dead load, plastic flow or creep plays a more significant role for columns than for beams or slabs. When a vertical load is placed on a reinforced concrete column, it is assumed that the concrete and steel are equally strained.

Immediately after the application of the load, the stress in the steel will be "n" times that in the concrete, where "n" as previously used is E_s/E_c. Due to a consistent load such as a dead load, the concrete will flow plastically and relieve itself of a portion of the stress. This stress will then be taken over by the steel.

For spirally-reinforced columns, the safe axially-vertical load is:

$$P = A_g(0.225\, f'_c + f_s p_g)$$

Because the spiralled steel assists in the resistance to the vertical load, while the bars do not, the safe axially-vertical load for tied columns is:

$$P = 0.8\, A_g(0.225\, f'_c + f_s p_g)$$

In both equations, P is the allowable axial load, A_g is the gross cross-sectional area and f_c is the ultimate cylinder stress of the concrete. f_s is the allowable steel stress in compression, (16,000 psi for intermediate grade steel, 20,000 psi for rail or hard grade steel), p_g is proportion of steel area to the gross concrete area, or A_s/A_g.

The following outline covers the design requirements of axially-loaded columns. The design equations are for short columns. A short column is defined as a column where the ratio of unsupported length, h, to the least lateral dimension, t, is less than 10. Most building columns are short columns; however, in the case of a long column, the following formula is used:

$$P' = P\,(1.3 - 0.03h/t),$$

where P is the allowable axial load on a short column and P′ is the allowable load on a long column.

We now have sufficient background to study the design of axially-loaded reinforced concrete columns. The first step in design is to establish the load that the column is to support. We note from one equation, then, that two variables are to be established; A_g and p_g.

Design of a Spiralled Column

Governing Data

h = 12 ft
Load from above = 220 k
f'_c = 3000 psi
f_s = 20,000 psi
f'_s (of spiralled steel) = 50,000 psi
Max. size aggregate = ¾ in.

Loads

Loads from above	220 k
Est. D.L. of column	6 k
Total	226 k

Dimensions

$P = A_g\,(0.225\, f'_c + f_s p_g)$ Assume $p_g = .01$

Then $A_g = \dfrac{226{,}000}{0.225\times3000 + .01\times20{,}000} = 258$ sq in.

and diameter $D = \sqrt{\dfrac{258\times4}{\pi}} = 18.15$ in.

Use D = 18 in.; then $A_g = 254$ sq in.

and $\dfrac{144}{18} = 0.8$, indicating a short column.

It is permissible to round off the required diameter to the nearest smaller figure; it requires a recalculation of p_g.

Area of Steel

$$p_g = \frac{\dfrac{226{,}000}{254}}{20{,}000} = .01075$$

$A_s = .01075 \times 254 = 2.73$ sq in.

Therefore, use nine No. 5 rods = 2.79 sq in.

Spiralled Steel

Use 1½-in. cover over spiralled steel; then $D_c = 15$ in. and $A_c = 177$ sq in.

$$p' = 0.45\left(\frac{A_g}{A_c} - 1\right)\frac{f'_c}{f'_s}$$

$$= 0.45\left(\frac{254}{177} - 1\right)\frac{3000}{50{,}000} = .0119$$

Volume of spiralled steel required in one inch depth of column = .0119 × 177 = 2.1 cu in. Assume No. 2 spiralled steel, then the volume of spiralled steel for one turn = .05 × π × 15 = 2.36 cu in.

$$\text{Spiral pitch required} = \frac{2.36}{2.1} = 1.12 \text{ in.},$$

which is less than the allowable minimum spacing of 1⅜ in. + ¼ in. Therefore No. 2 spiralled steel is unsatisfactory.

Try No. 3 spiralled steel, then the volume of steel for one turn = .11 × π × 15 = 5.18 cu in.

$$\text{Spiral pitch required} = \frac{5.18}{2.10} = 2.47 \text{ in.}$$

Therefore use No. 3 spiralled steel at 2¼-in. pitch; clear spacing is 2¼ - 1⅞ in., which is within the minimum and maximum spacing requirements set forth in Table I.

Design of a Tied Column

Governing Data

h = 12 ft

Load from above = 220 k

Table I. Comparisons of spirally-reinforced and tied columns.

	Spirally-Reinforced Column	Tied Column
Allowable Load	$P = A_g (.225 f'_c + f_s p_g)$	$P = 0.8 A_g (.225 f'_c + f_s p_g)$
Concrete Dimensions	Minimum diameter 12 in.	Minimum dimension 8 in. Minimum area 120 sq. in.
Vertical Steel		
a) p_g	$0.01 < p_g < 0.08$	$0.01 < p_g < 0.04$
b) Minimum number	6	4
c) Minimum size	No. 5	No. 5
d) Minimum center-to-center spacing	2½ bar diameters	2½ bar diameters
Horizontal Steel		
a) p′	$p' = 0.45\left(\frac{A_g}{A_c} - 1\right)\frac{f'_c}{f'_s}$ Where p′ is the ratio of volume of spiralled reinforcement to the volume of the concrete core (outside to outside of spirals); A_c is the area of the core; f_s is the useful limit stress of spiral reinforcement—40,000 psi for hot rolled rods of intermediate grade, 50,000 psi for rods of hard grade and 60,000 psi for cold drawn wire. A_g and f'_c previously defined.	
b) Minimum size	No. 2 for rolled bars No. 4 AS&W gage for drawn wire	No. 2
c) Minimum spacing	Clear spacing 1⅜ in. or 1½ times the maximum aggregate size	
d) Maximum spacing	Clear spacing 3 in.	16 vertical bar dimensions 48 tie diameters least dimension of column

$f'_c = 3000$ psi

$f_s = 20{,}000$ psi

Design a square column for minimum steel.

Loads

Loads from above	220 k
Est. D.L. of column	6 k
Total	226 k

Dimensions

$P = 0.8 A_g (0.225 f'_c + f_s p_g)$

Assume $p_g = .01$

$$\text{Then } A_g = \frac{226{,}000}{.8(.225 \times 3000 + .01 \times 20{,}000)} = 323 \text{ sq in.}$$

$$\text{Then } t = \sqrt{323} = 18 \text{ in.}$$

Use 18 in. × 18 in. column; $A_g = 324$ sq in.

$$\frac{h}{t} = \frac{12 \times 12}{18} = 0.8, \text{ indicating a short column.}$$

Area of Steel

$A_s = .01 \times 324 = 3.24$ sq in.

For tied columns, an even number of rods is used for symmetry. In a square column, a number that is a multiple of four is generally used.

Therefore use eight No. 6 rods = 3.52 sq in.

Design of Ties

The three criteria shown in Table I are used to determine maximum spacing.

Sixteen vertical bar dimensions = 16 × ¾ = 12 in.

Least dimension of column = 18 in.

Use the tie size that would conform with the least of the above two dimensions.

$$\text{Use } \frac{12}{48} = \text{¼-in. tie}$$

Use No. 2 ties, on 12-in. centers.

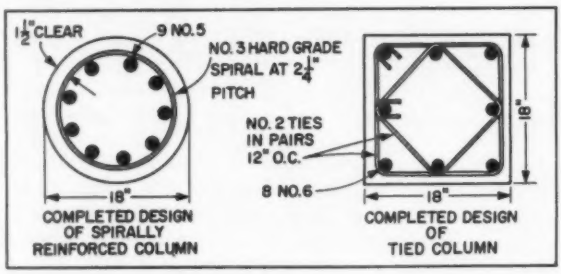
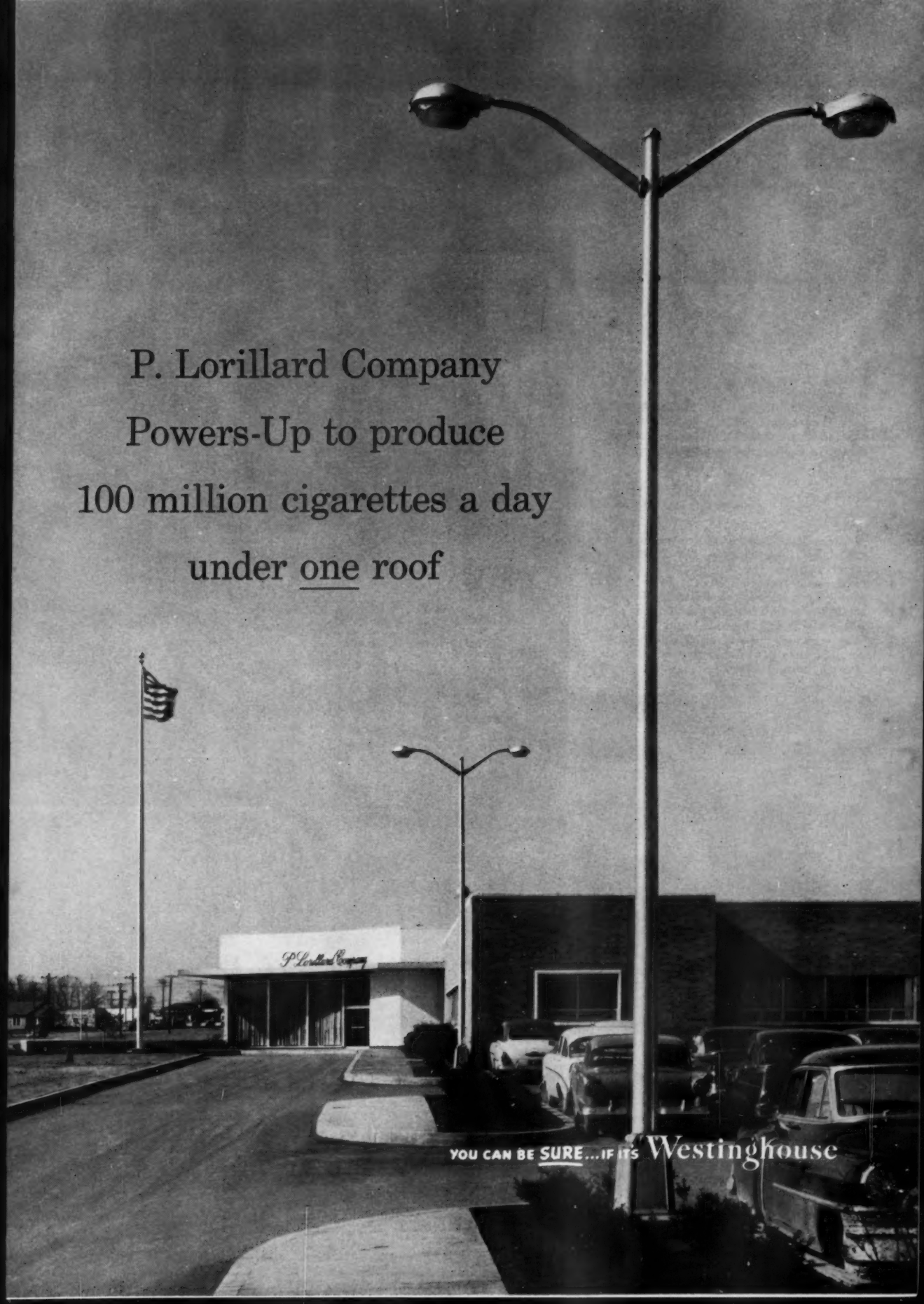


Fig. 3. Completed designs of column types calculated in text.

An economic study of the two designs will show that although there is a large amount of spiralled steel used which is more expensive than the tie rods, pound for pound, the total cost of spiral columns will be less than the tied. This will be true because there is less total material used in the spirally-reinforced column than the tied. Also, circular columns are less expensive to form, since paper forms may be used.

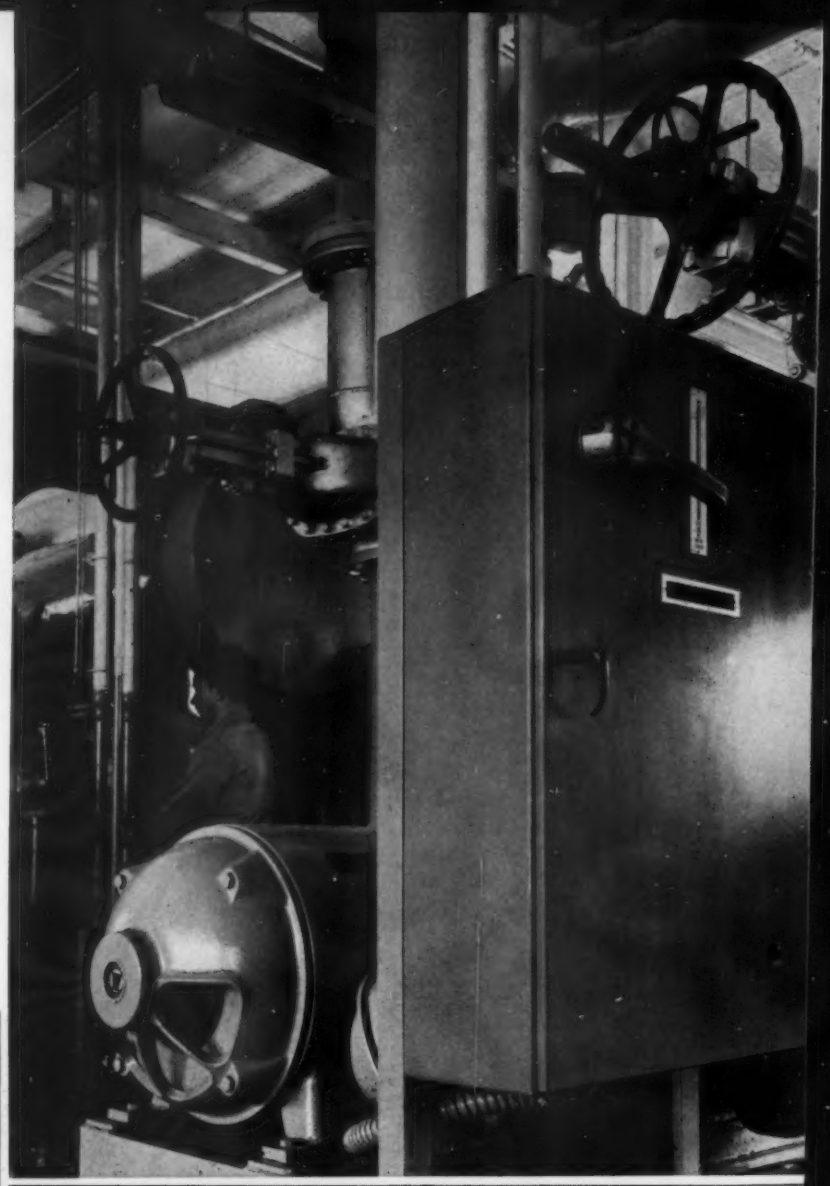
However, the cost of the column is not the only consideration in the selection. Esthetics and the problems of framing beams and partitions into circular columns play large parts in the selection.

Columns discussed in this Brief are only the axially-loaded columns. When there is bending in addition to the compressive force, new problems are presented. These will be discussed in the next Brief.


P. Lorillard Company
Powers-Up to produce
100 million cigarettes a day
under one roof
P. Lorillard Company
YOU CAN BE SURE... IF IT'S Westinghouse

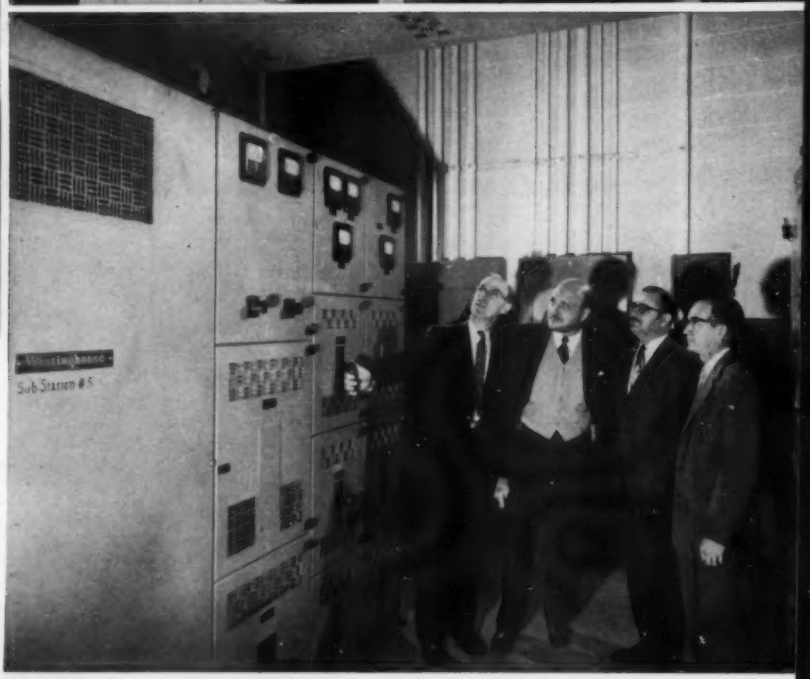
FRONT COVER

The completely new "electromated" Greensboro, N. C. branch of the P. Lorillard Co. is designed for tomorrow's expansion, both in power and plant layout, as well as for today's immediate production needs. Westinghouse type OV-20 outdoor lighting is used for the building approach and 650-car parking area.



▶ A Westinghouse class 11-404 reduced-voltage starter provides automatic starting and protection for the Westinghouse Life-Line® 60-hp motor. The motor is part of a system which automatically controls the "man-made" climate, so necessary in the cigarette-making industry.

▼ A Lorillard maintenance man inspects the class 11-400 reduced-voltage starter which controls the 200-hp Life-Line air compressor motor supplying air to safeguard instruments. A 400-amp, 600-V, AHF-355 safety switch is shown in the background. On the wall (right) are two Westinghouse class 11-404 reduced-voltage starters providing protection for Westinghouse motors.



▶ O. B. Van Hise, Lorillard Plant Engineer; Wm. Folk, Jr., Westinghouse Sales Engineer; J. E. Guill of Starr Electric Co., Inc., Electrical Contractors and Engineers; H. L. Coble, H. L. Coble Construction Co., General Contractor, examine one of the plant's nine dry-type power centers. Power centers have spare circuit breakers plus blank cubicles equipped for future power needs. Overhead bus duct serves as tie-run between power centers.

J-94115-2

Westinghouse electrical equipment used for today's production and tomorrow's expansion

P. Lorillard Company, the nation's oldest tobacco firm, is now occupying the newest and most modern cigarette manufacturing plant in the country. Relying heavily on Westinghouse equipment, the ultra-modern Greensboro, North Carolina plant is electrically powered to expand capacity or to shift emphasis from filters to non-filters (or vice versa) almost overnight.

The plant is unique in the tobacco industry not only in design, but because it represents many departures from standard industry procedure. In some instances, departures were so great that new, complex machinery was designed and built.

Power is transmitted to the completely "electromated" plant at 22,000 volts and stepped down by Westinghouse transformers to 12,500 volts and distributed to nine power centers throughout the plant. These network power centers distribute 480/277 volts and are interconnected to avoid shutdown in the event of a partial power failure.

Lorillard minimized human error and bolstered production by installing Westinghouse-driven and controlled automatic feeder-conveyors to move the processed tobacco in a steady flow above cigarette-making machines, feed it into the machines and automatically maintain the precise level of tobacco in hoppers. This system assures uniform filling and quality of every cigarette.

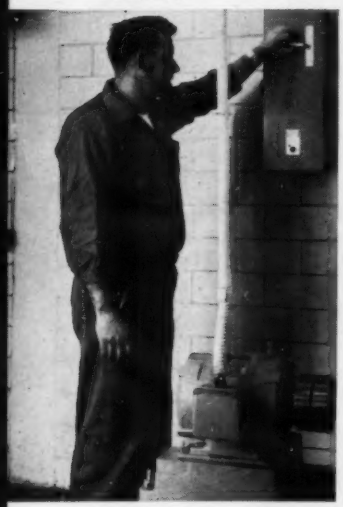
In addition to the substation transformers and electrical equipment for the conveyor system, Westinghouse supplied the power centers, motors and controls for the air conditioning system and outdoor lighting for the building approach and plant parking area.

Westinghouse, working with the architect-engineer, general contractor, electrical contractor and Lorillard engineers, had an active part in equipping this plant with the electrical distribution system and with other electrical components required to assure uninterrupted operation and provide for anticipated expansion. Westinghouse can help with

(cont'd)

S *Over 250 pages Westinghouse data in Sweet's Construction File*

J-94115-3



This Life-Line class 11-204 motor starter, with fusible disconnects, which activates the Westinghouse 3-hp Life-Line "A" motor to drive a 75-gpm pump, is located in the mechanical equipment room of the ultra-modern plant.

Westinghouse class 11-204 combination magnetic motor starters with fusible disconnects provide remote control and protection for Life-Line "A" motors located throughout the conveyor system. Equipment is designed to move tobacco from hogshead to finished cigarette without being touched by human hands.

Straight-line feeder-conveyor system continues through automatic cigarette-making, packing, cartoning and shipping. Westinghouse automatic controls, pushbuttons and switches "spot control" the conveyor process.

YOU CAN BE SURE...IF IT'S Westinghouse

Specially designed for tomorrow's expansion

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Owner: P. Lorillard Company, New York, N. Y.
Architect-Engineers: Lockwood Greene Engineers, Inc.
General Contractor: H. L. Coble Construction Co.
Electrical Contractor: Starr Electric Co., Inc.
Westinghouse Distributor: Westinghouse Electric Supply Co., Greensboro, N. C.

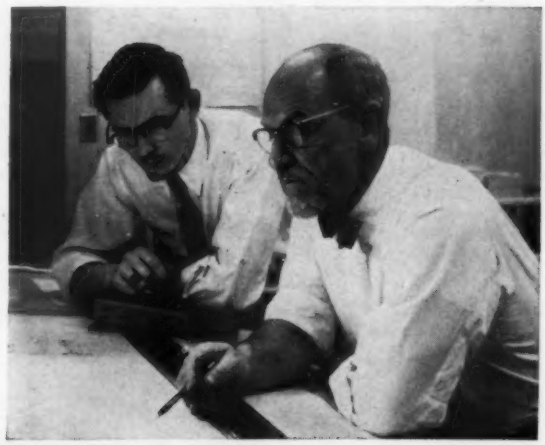
New complex machinery had to be designed and built by Lorillard to achieve this highly automated plant. J. Berner, Project Engineer, conceived, planned and built much of the special equipment. (Both Berner and R. H. Jobe, Lorillard Draftsman, sport beards in honor of Greensboro's 150th anniversary.)

For more facts circle 565 on Reply Card

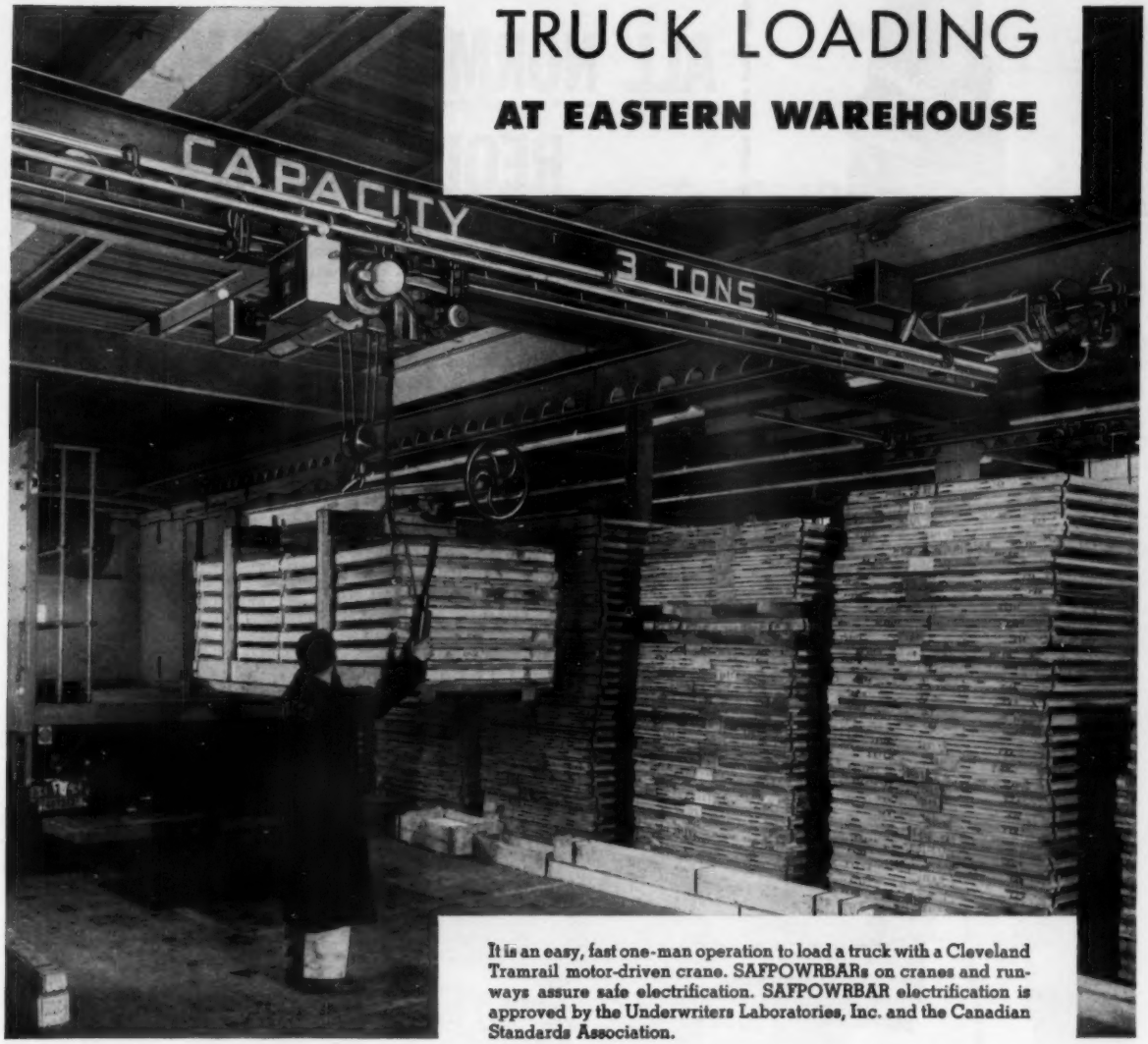
Wm. Folk, Jr. (right) explains the full line of electrical equipment carried by Westinghouse distributors for immediate delivery. This reduces the inventory Lorillard must carry for replacement needs. Others shown left to right: W. D. Rhea, Power Engineer; M. W. Breitmeier, Plant Maintenance; O. B. Van Hise, Plant Engineer; J. Berner, Project Engineer; all of Lorillard Plant Engineering Section.

YOU CAN BE SURE...IF IT'S

Westinghouse



TRAMRAIL CRANES SPEED TRUCK LOADING AT EASTERN WAREHOUSE



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The Cleveland Tramrail cranes enable piling the materials higher and thereby increase the effective storage capacity per square foot of floor area.

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WHAT'S JUST AHEAD IN THIS ISSUE?

- THE MEANING of power factor has been interpreted many times in the past and probably will be further interpreted in the future. The author of the article on pages 88 and 89 presents a basic discussion on the subject, touching on the significance of high power factor and the voltage-current relationships. He tells you how you can get more use out of power that is delivered to your plant.

- CAN YOU park more cars in your plant's parking lot? Engineers at Philip Morris did. They studied their present parking arrangement and traffic flow, then made some changes. Now, they are able to park 140 cars where they could previously park only 103. To see how they did it, turn to page 90.

- REDUCTION OF machine downtime was accomplished at a Columbia Records plant by the installation of accumulators. As a result, the hydraulic pressure system on the machines operates more smoothly, reducing rejects by 25 per cent. The article describing the installation begins on page 99.

- TRAINING maintenance personnel pays in many ways. The Ford Motor Company has set up a thorough training schedule for maintenance personnel. The types of courses, textbooks, hours of training are listed in this article and should prove helpful to any other plant engineering department considering a training program. The article begins on page 101.

- ARE YOU getting all the lighting you are paying for? You are, if you have a good lighting maintenance program in your plant. There are a number of tools and methods to make this job an easy one. The article on page 105 discusses these methods.

- ALL THE troublesome little details of designing exhaust ventilation for buffing and polishing operations are thoroughly explored in the six-page article starting on page 109. Author Barrett, Ventilation Engineer for the Division of Occupational Health, State of Michigan, takes each job from the primary steps of the functions of design through the methods of selecting the proper hood. Automatic buffing operations and their special problems are also covered.

- ARE YOU interested in knowing the trends in outside contracting of construction and maintenance work? Is it considered more or less expensive than having your own employees do it? Does the type of industry or geographical location have any influence on the choice? The factors involved in this phase of plant maintenance are presented in the article beginning on page 119.

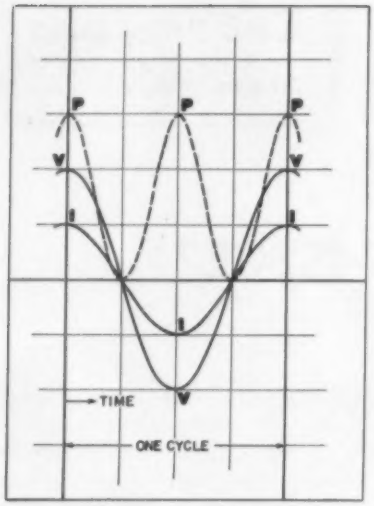


Fig. 1. Resistor power curve. Both the voltage and current peak at same time.

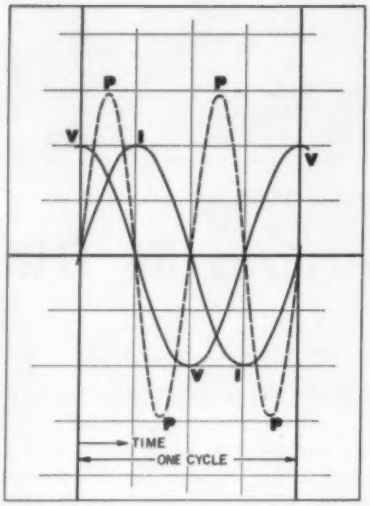


Fig. 2. Power curve for inductance. Current lags voltage by 90 degrees.

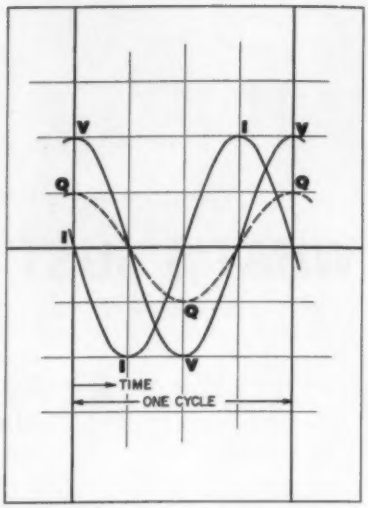


Fig. 3. Charge curve for pure capacitance. Current leads voltage 90 degrees.

HIGH POWER FACTOR LOWERS COSTS

Releases Feeder Capacity for Useful Work

By WILLIAM A. WEIBEL, Curtis Lighting, Inc., Chicago, Illinois

ELECTRICAL equipment and systems must have certain electrical characteristics if they are to be operated safely and efficiently. Of these characteristics, voltage and current are commonly known and are recognized even by many people not otherwise familiar with electrical terms.

Equipment and systems operating on alternating current must also consider power factor for maximum efficiency. Power factor, by one definition, is that proportion or per cent of actual power current to total current in an electrical element or system. In direct current systems, power factor is always unity as the actual power current is always equal to the total current.

In a-c systems the power factor could be unity but may range down to zero depending on the relation of actual power current to total current. Alternating current is regularly changing as to magnitude, direction and with respect to time. These changes cause the power factor to vary depending upon the values of resistance, inductive reactance and capacitive reactance found in the circuit.

In a resistance, the current makes an immediate change following any change in the voltage. This could be the non-regular changes in voltage of a d-c circuit or the regular and usually rapid changes of voltage found in an a-c circuit, Fig. 1.

In an inductance, the current does not change in step with the voltage. This is because the inductance, which may be a coil in a motor or transformer, causes a time interval between voltage change and the change in current. The interval or "lag" is due to a magnetic field about the turns of the coil.

This magnetic field increases as the voltage increases but as the voltage starts to decrease energy of the magnetic circuit returns, in part, to the electric circuit and tends to sustain the current in the coil, Fig. 2. The time lag is dependent on the inductance value of the coil and any metal forming a magnetic circuit for the field.

In a capacitance, the current is also displaced in the time interval and does not exactly follow the cyclic variations in voltage. This displacement is exactly opposite that caused by an inductance and the current is said to "lead" the voltage, Fig. 3. This effect is present in an a-c circuit when metal surfaces are oppositely charged by the circuit voltage and are separated by an insulating material.

Capacitors are usually constructed of metal foil, paper and an insulating liquid. They have no moving parts and require little maintenance. If correctly selected as to voltage and current requirements of the application, they will provide years of troublefree service.

Transformers, motors, holding coils and relays when operated on an a-c system cause the line current to "lag" the voltage. The total line current is a combination of the load current and a magnetizing cur-

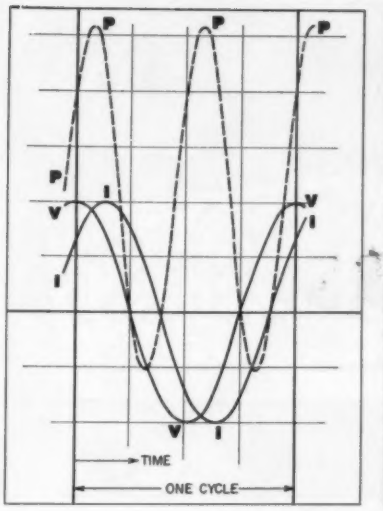


Fig. 4. Power curve for circuit having both resistance and inductive reactance.

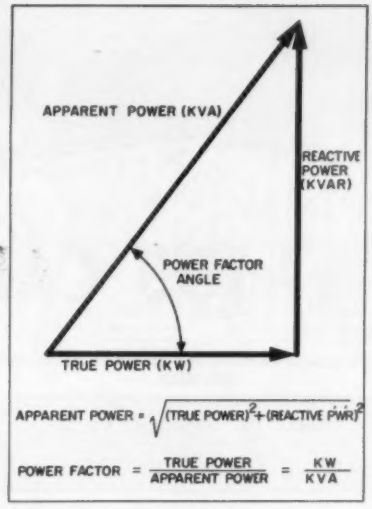

APPARENT POWER (KVA)
REACTIVE POWER (KVAR)
POWER FACTOR ANGLE
TRUE POWER (KW)
APPARENT POWER = √(TRUE POWER)² + (REACTIVE PWR)²
POWER FACTOR = TRUE POWER / APPARENT POWER = KW / KVA

Fig. 5. Relationship between apparent power, true power and power factor.

rent required because of the inductance of the device, Fig. 4.

Capacitors, drawing a "leading" current are therefore a logical and economical source of the required magnetizing current for a single device, a group or a complete system. If this magnetizing current is not supplied by shunt capacitors, synchronous condensers or synchronous motors, it must be supplied by the ultimate source of system energy.

If this source is the generating facilities of the public utility, there could be a considerable distance between the source and point of use. Connecting lines, transformers, feeders, switchgear and the generators themselves would all be required to carry this magnetizing current.

Obviously, the larger the magnetizing current being carried by such a system, the larger each element will have to be if a given load current is to be supplied. The ideal solution is to supply magnetizing current very close to the point of use, thereby reducing line loss and voltage drop. For a given connected load, investment in distribution lines, transformers, switchgear and generators decrease with an increase in system power factor.

This leads to the fact that the ultimate user is paying for power factor correction whether he actually has it or not. A few tests of individual motors as well as system power factor in a plant will serve to emphasize this. If low power factor is found and additional power is required on that particular feeder, the choice is simply to improve the power factor or increase the distribution system. Power factor improvement is usually the easiest and most economical choice.

Power factor improvement cannot only provide for larger loads but it can also help those loads operate more efficiently. Operating at low power factor robs a device of needed voltage and load current. Here is an example, taken from the field of fluorescent lighting, that will help to emphasize these facts.

A ballast for a fluorescent lamp is a special transformer which supplies the high voltage necessary to start the lamp and then acts as a current limiting device. Such ballasts are available with either high or low power factor. Operating data for typical ballasts designed to operate two, 48 in., 40 watt lamps is shown in the table.

Two of the low pf ballasts would require 2.6 amperes line current while three of the high pf ballasts would only require 2.55 amperes. The input wattage would be 186 for two low pf ballasts and 276 for the three high pf ballasts.

Operating from the same distribution lines, the same line voltage and slightly less line current, the number of ballasts the input wattage and the amount of generated light would be increased approximately 50 per cent when the pf is increased from 0.606 to 0.916.

Many electrical devices have shunt capacitors included as a standard part of the device to provide for pf correction. This greatly simplifies installation, fusing, switching and maintenance of the capacitors and reduces line losses.

Capacitors cause a voltage rise at the point of installation. To protect against over-voltage they are generally removed from the line during those periods when not required by the system. This need favors the use of individual switches that also control the load unit.

Continuous operation of a capacitor at voltages or temperatures above design limits will shorten its life. The insulating material within the condenser is most likely to be damaged by elevated temperatures and voltages. Protection from overcurrent may be had through the use of fuses or circuit breakers.

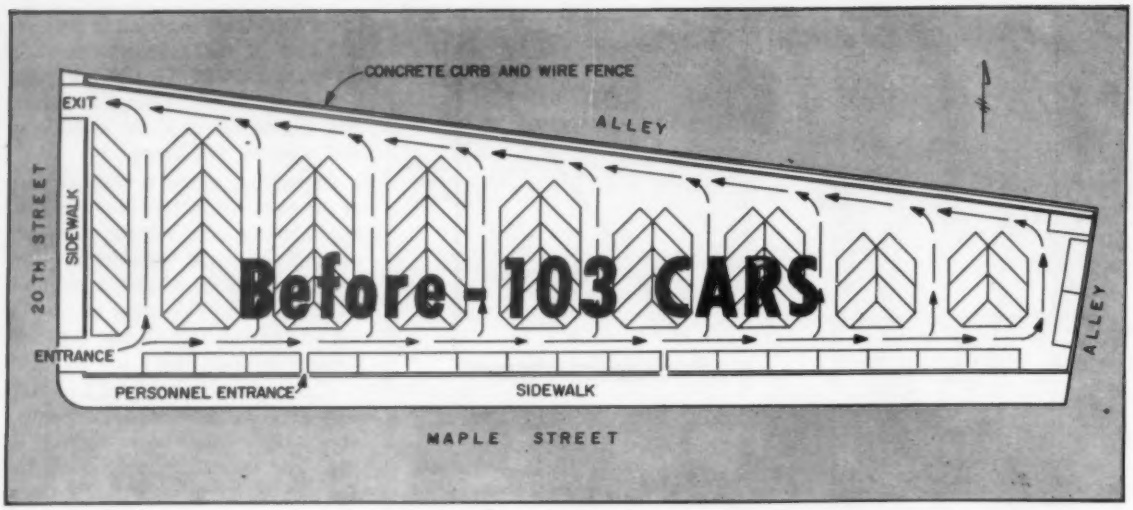
Always discharge a de-energized capacitor with an insulated conductor before touching any terminals or bus connections. The National Electrical Code requires installation of capacitors to provide for reducing the voltage to less than 50 volts in less than one minute for capacitors operating at less than 600 volts. Although it may be assumed that a capacitor of standard manufacture has a discharge resistor built in, it is always safe practice to make sure by discharging the capacitor yourself.

Table shows data for two ballasts designed for two 48-in., 40 watt lamps.

Lamp Watts	Lamp Amps	Line Volts	Line Amps	Input Watts	Power Factor
40	0.430	118	1.30	93	0.606
40	0.430	118	0.85	92	0.916

In a power circuit, the product of the voltage and current is called the apparent power. It is measured in volt-amperes or kilovolt-amperes, abbreviated to va or kva. The true power is measured in watts or kilowatts. The ratio of true power to apparent power is power factor.

Power which is due to magnetizing or capacitor currents is known as reactive power. It surges back and forth in the circuit but does no work. The interrelation of apparent power, true power, reactive power and power factor, Fig. 5, is commonly illustrated in the triangular form at the top of this page. **End**



This is how the car space was allotted in the plant parking lot before the rearrangement. Only 103 cars could be parked.

PARKING LOT LAYOUT CHANGED—

By B. H. GRIESBACH, Engineer, Philip Morris Inc.

AS THE PERSON responsible for your plants parking facilities, have you ever secretly wished that all of your employees drove Volkswagens?

Well, we have many times. Here at the Philip Morris' plant in Louisville, Kentucky, we presently have parking facilities for 238 automobiles.

As an average, we employ approximately 1500 people of whom 475 are employed on the second shift.

Our company parking lots operate on the basis of first come, first served. Those who are unable to park in these lots park on the streets surrounding the plant.

About eight years ago, our parking lots were laid out on the basis of the then current smaller and shorter automobile. In the last few years, cars have grown in size. These longer, bigger cars are harder to park, harder to maneuver and, in a parking lot, a great problem.

Our parking lot problem became acute and it was evident that some action had to be taken. One of the original difficulties with one of our parking lots was its irregular shape. At one time, we had contemplated making two exits, one at each end of the parking lot. City restrictions, however, prevented us from considering such a proposal.

Above sketch shows one of our parking lots as it was originally laid out. This arrangement held 103 automobiles.

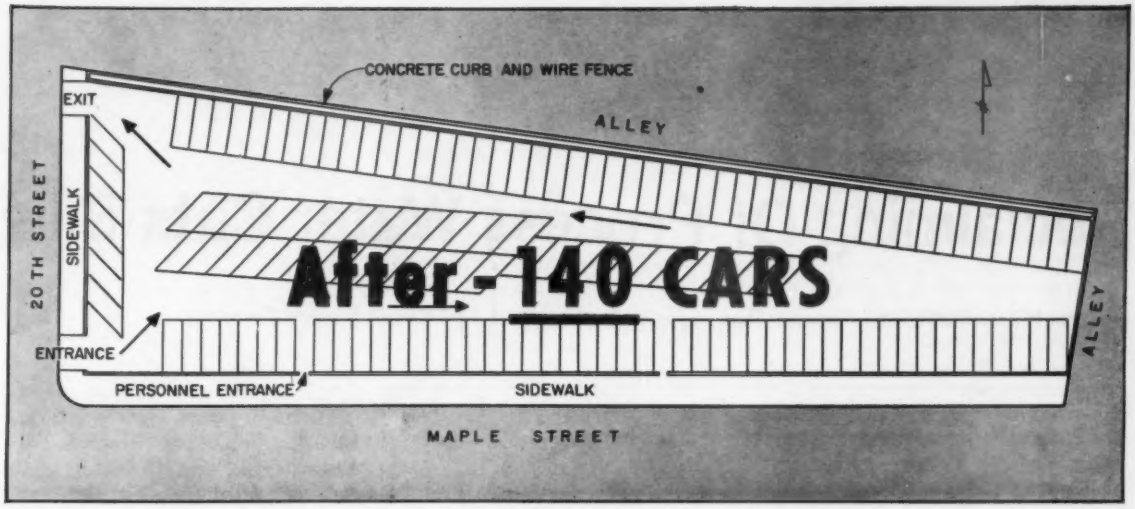
At quitting time, this particular lot became bedlam. Short tempers were aggravated by cramped quarters. Short turns and out-of-line parked cars provided more aggravation. Employees were constantly fighting and arguing among themselves about bumped fenders, dented doors and scratched automobiles.

In order to arrive at a practical solution, we wanted to be able to watch the entire parking lot in action. To accomplish this, we felt it was necessary to observe the operation from a vantage point at the three critical times; namely, starting, lunch time and quitting time. With this in mind, we hit on a novel idea for observing the lot.

Our plant is seven stories tall and faces directly across the street from our main private parking lot. Members of our engineering staff were stationed on the roof of the plant for one week's time. Here, we watched the parking operation at 6:30 in the morning, at lunch time and at 3:30 in the afternoon. From our lookout, we were able to watch the flow of traffic, the traffic jams and the general confusion.

We made several photographs of the automobiles in their proper parking places. After one week of observation, there emerged a definite traffic pattern in our minds. With this pattern in mind, we transferred our thoughts to the drawing board.

Scale model templates were made to represent the largest automobiles parked in our parking lot. These templates were shifted and moved, pushed and pulled until we felt that we had the best parking arrangement, the most economical use of space and the easiest facilities for entrance and exit to lot. Our new layout provided space for 140 modern automobiles. Our next step



After examining the general traffic pattern, this parking arrangement was devised. It is now possible to park 140 cars.

RESULT: MORE CARS, SAME SPACE

was to put the layout to the acid test.

Over a weekend, we chalked out new aisles and parking stalls. We notified the plant employees that, starting the following Monday, a new trial system of parking would be attempted. We explained to these employees that the plan was to provide more parking space, faster car movements and to minimize the damages occurring through crowded aisles, narrow turns and poor traffic flow.

The following Monday, we set the new plan into operation. The engineering department came to work early and cooperated with the plant protection staff in getting the cars into the lot.

Our new system called for a one-way traffic flow, that is, one entrance and one exit to the parking lot. Our engineering force directed the traffic into the lot while, at the same time, others directed the employees on how to specifically park their cars and properly back into the marked-out stalls along the outer edges of the lot. While this operation was being carried out on the ground, other members of our staff were watching the procedure from the plant roof. From here, we were able to observe the over-all picture and to watch bottlenecks develop.

The first day's operation pointed out to us that certain changes were necessary to provide the minimum amount of confusion. These changes were made and the next few days showed a marked improvement in the traffic flow. In the meantime, the employees caught on and took an active interest in the changes which had been made for parking.

Loading and unloading the lot was much faster. There were even very few cases of scratched fenders. Even with the improvement in the employee moral, we had gained additional parking space for 37 more automobiles.

Once the parking routine was established among our employees and to the satisfaction of the engineering department, permanent yellow parking lines were painted. Back-up stops were provided to position the cars and to keep them from backing into the fences.

After the parking lot is filled in the morning, both the entrance and exit lanes are chained and locked and are not opened again until lunch time. After lunch, the chain is again locked and is not opened until quitting time.

In the event that it is necessary for an employee to leave the parking lot before normal lunch time or quitting time, it is necessary for him to contact plant protection who then open the chains to permit him to leave. This procedure prevents non-authorized persons from driving in or out of the lot as well as providing protection from theft.

As a further step in the improvement of our parking facilities, we have issued to all employees, driving automobiles to work, a numbered decal bearing the name of Philip Morris and a serial number. This serial number is registered in the personnel office.

In the event that any particular car is parked wrong, or its lights are left on, the owner can be quickly contacted and the trouble speedily corrected. **End**

Reclaiming Of Process Water Cuts Bills

By WALTER JACOBY, Maintenance Supt., Special Products Div., I-T-E Circuit Breaker Company

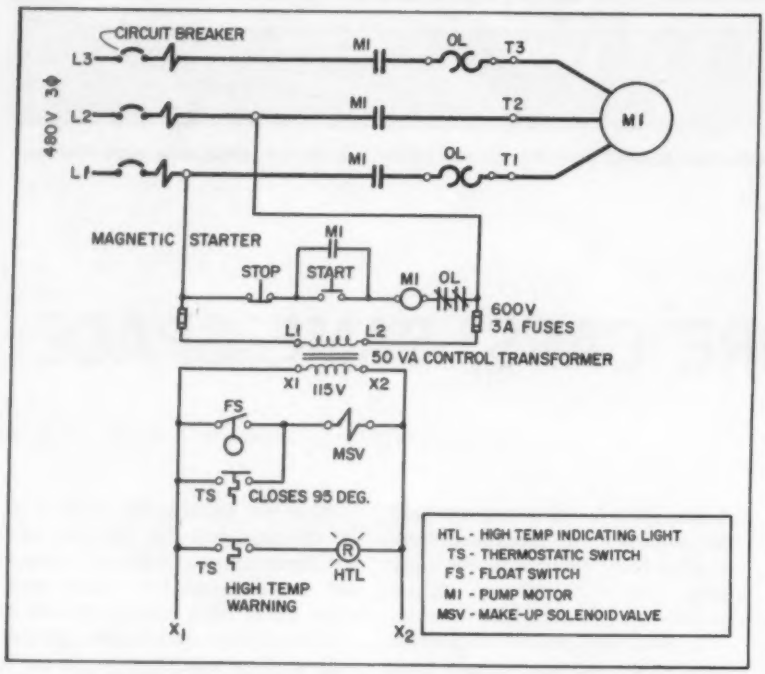
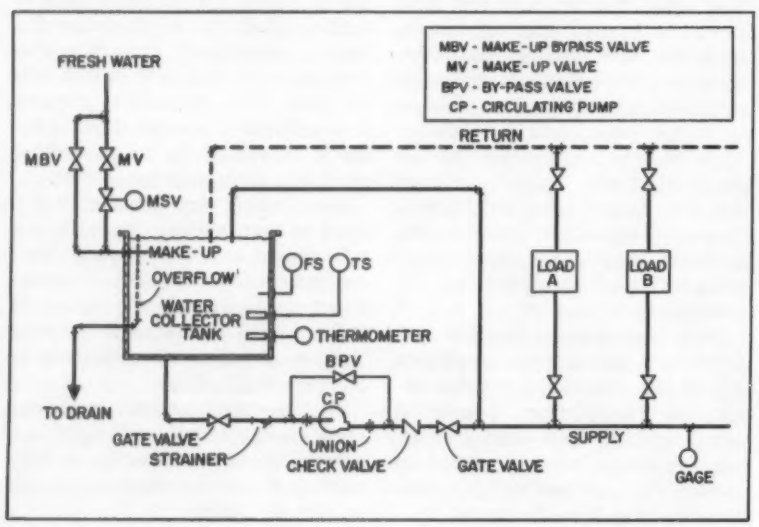


Fig. 1, top, is wiring diagram for welding water recirculation system. Fig 2, below, shows recirculating of fusion and resistance welding cooling water.



WATER WASTAGE at our plant was always an unpleasant topic so when, in 1957, the City of Philadelphia announced an increase in the water rates, effective January 1, 1958, it became imperative that process water be reclaimed.

Previous annual water bills averaged $24,000. The rate increase would have raised this average yearly cost to approximately $33,000. Over a period of two years, the saving of $18,000 could pay for a handsome piece of equipment.

A load study was conducted to determine where the most practical application of recirculating equipment could be made. Typical areas included air conditioning, heat treating equipment, fusion and resistance welding machinery, air compressors, and lavatories. Manufacturers' specifications were checked, quantities and inlet and outlet temperatures measured to determine heat pick up.

Tests showed that heat treating, air conditioning and welding equipment were the greatest water consumers and the only loads worth reclaiming.

When all equipment was operating in the heat treating department, 55 per cent of total water consumption was used there. This fact automatically fixed the location of the reclaiming equipment. Thirty-eight tons of air conditioning were within 15 ft of this area. The decision to place the evaporative cooler in the heat treating area and pick up its associated load plus the air conditioning water, presented no argument. But what was to be done with the welding water?

Welders were scattered throughout the plant. Cooling the welders

50 Per Cent at I-T-E

and associated equipment was a source of water wastage and operators made no attempt to control water flow to machine components. Machine operators did not modulate water valves to meet load demand, but rather, recognized only two valve positions: open and closed.

A recirculating system was installed, Fig. 1, to take the control of water flow out of the hands of machine operators. By pumping water through the welding equipment, then back to a collector tank where fresh water is added at a rate to maintain sufficient heat transfer, individual machine valve positions become inconsequential. Water was used at a rate necessary only to prevent overheating. Pumps were selected to maintain a minimum of 30 psi under full load.

A welding recirculating tank, made by cutting discarded solvent storage tanks in half, was installed on a production line. Essential components include a make-up water solenoid valve, float switch, thermometer and temperature switch.

The tank need be only large enough to maintain air-free suction. Scale removing compound was dumped into the tanks to clean resistance welding transformers, tips, and other water circuits. The pH value of the water is maintained between 6.5 and 7.5.

Figure 2 is a schematic piping diagram of the recirculating system. The make-up solenoid valve (MSV) has a built-in adjustable by-pass, which is to allow some make-up water to flow continuously. This causes constant cooling and continuous surface blow on the tank. The by-pass is set to just skim the surface water off the overflow, (OF).

If the water temperature exceeds 95 F, the thermostatic switch (TS) energizes the make-up solenoid valve and adds fresh water at full make-up flow until the temperature is reduced to 90 F. This circuit insures supervised make-up control.

The float switch (FS) energizes the solenoid valve if the tank head is reduced below low water level. If the temperature overshoots, the high contact of the thermostatic switch energizes the high temperature pilot light (HTL) as shown in the wiring diagram in Fig. 1.

There are five such recirculating units in service, which have been responsible for $400 of the total savings on our monthly water bill.

Remaining water loads called for effective cooling, as large quantities were involved. Mechanical refrigeration, natural and forced draft towers and evaporative coolers were considered.

The heavy concentration of heat treating load, plus nearby air conditioning equipment, made the location of the equipment selected almost mandatory. Evaporative cooling was the obvious choice because an abandoned tank pit was available in the area.

The pit contained adequate drainage facilities for overflow due to spray or pump failure, a condition that could arise requiring return of the overflow to city water until repairs could be made. Closing the main valve to load and opening the city valve to this area is all that need be done to make the transfer. Water will then pass to the drain from the collector tank located in the pit below the cooler.

Water is cooled at the rate of 160 gpm, from 116 F to 87 F when the outside wet bulb temperature is 78 F. For each degree of wet bulb depression below 78 F, the entering and leaving water temperature is reduced approximately 1 F. Fan capacity is 25,000 cfm.

There are two spray pumps on each cooler. Also, located in the pit adjacent to the collector tank, are two circulating pumps. By operating the pump transfer button, a stepping relay is energized which in turn, de-energizes one set of spray and circulating pumps and energizes the other. Each pump is operated during alternate weeks, the change being made every Monday morning. Automatic transfer valves will soon be installed so that, in the event of a power failure, water will come from the city supply. A float switch allows the pump under the tank to run only when a head of water is in the tank.

The 7½-hp circulating pumps and 3-hp spray pumps are alternately controlled through a standard reversing magnetic starter, reconnected for step control.

The manual by-pass dampers are opened in cold weather to prevent the spray water freezing. Returns for all the equipment connected to the evaporative cooler are located alongside it, affording the operator ready control of water to equipment.

Installation of this equipment has shown promising results. Billing for the first eight months of 1958 was:

Month	Billing
January	$2,500.00
February	2,100.00
March	2,100.00
April	2,200.00
May	2,400.00
June	2,400.00
July	2,100.00
August	1,500.00

Water loads were connected to the recirculating system in June. During the month of October, the water conservation program was completed. It is estimated that water bills will now fluctuate between $800.00 and $1200.00 per month all year around and will bring a return on investment in two years. **End**

HOW CORN PRODUCTS LICKED A THERMAL SHOCK PROBLEM

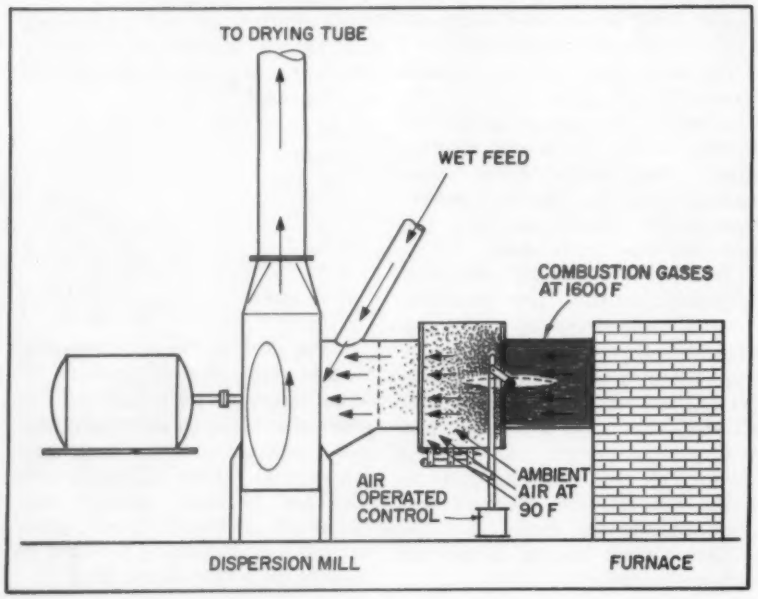
By DANIEL De VRIES, Plant Engineer, Corn Products Refining Company

HIGH TEMPERATURE corrosion is a basic process by which metals fail, and it is one of the most troublesome problems encountered in industrial processing. The manner in which Corn Products Refining Company solved a problem of this type holds particular interest for plant engineers and maintenance personnel confronted with stress cracking and warpage at elevated temperatures.

In its plant at Corpus Christi, Texas, Corn Products processes grain sorghums into a wide variety of products. Proper control of moisture content is important from the standpoint of both production cost and quality control of the product in storage.

The drying step is accomplished in a large flash dryer which consists of a gas-fired furnace, dispersion mill, drying tubes and product collection cyclones. While this system proved rapid and efficient, it posed a troublesome problem because of the high temperature of the combustion gases. Ultimate solution of the problem depended upon finding a material with sufficient high temperature strength and oxidation resistance to stand up to the severe requirements of this service.

Fig. 1. Details of dryer show how ambient air at 90 F and combustion gases at 1600 F caused thermal shock, stress cracking and high temperature corrosion.



Here's how the system, shown diagrammatically in Fig. 1, works. Furnace combustion gases at 1600 F are blended with air at ambient temperature and passed to the dispersion mill, where the wet feed product is dispersed into the hot air stream. To bring about swift, effective moisture removal without subjecting the product to excessive heat, the temperature of this gas-air stream must be held within narrow limits.

Comparative ratios of combustion gas and quenching air are controlled by a 42-in.-diameter damper located in the duct between the furnace and the dispersion mill. The damper setting is determined by the exit gas temperature at the collection cyclone, acting through a temperature controller and mechanical operator which adjusts the damper setting.

Originally, this damper was constructed of steel, but failure occured within a few weeks due to the extreme temperature stresses induced by the 1600 F gases on one side of the damper and quenching air at ambient temperature on the other side.

It was quickly obvious that a material less subject to stress cracking at elevated temperatures must be found. First substitute tried was type 316 (18-11) stainless steel. A replacement damper of this material was fabricated and installed. While a step in the right direction, service life, however, was again unsatisfactory. The stainless steel damper provided an average service life of

only about three months' operation.

Each failure not only resulted in production delays of from four to six hours but also required expenditure of extra labor for emergency repairs as well as cleanup operations. In order to minimize the dryer downtime due to damper failures, it was necessary to carry an inventory of costly spare dampers in the storeroom.

Corn Products engineers at the Corpus Christi plant instituted a search for a more suitable material for this rigorous service. When they contacted technical representatives of Haynes Stellite Company the latter recommended trial of a disc and shaft assembly of Hastelloy alloy X. This high-nickel chromium alloy is available in all common forms and is easily fabricated, yet combines excellent strength with unusual resistance to oxidation at temperatures as high as 2200 F.

Nuts and bolts of alloy C were recommended as fasteners because of their known stamina under severe oxidizing conditions and thermal shock at 1600 F.

On the basis of these recommendations, shop personnel at the Corpus Christi plant fabricated a new damper from the 10-gage discs of the alloy, 42 in. in diameter, bolted to a 2-in. diameter shaft of alloy X with bolts and nuts of alloy C.

The two discs were joined around the circumference by welding with alloy X rod. The material can be welded by metallic-arc, inert-gas-shielded arc, submerged-melt and Sigma welding methods. The inert-gas-shielded arc process yielded the desired results in welding the discs at Corpus Christi. The new damper was placed in service in September, 1956 — and maintenance problems ceased.

After 22 months of operation in the duct, inspection of the damper indicates no sign of stress cracking or warpage, and it appears that many years of additional life can be expected.

Economies resulting from solution of this stubborn problem have been substantial. Use of the new damper has already resulted in maintenance savings amounting to several thousand dollars, in addition to elimination of production downtime. **End**

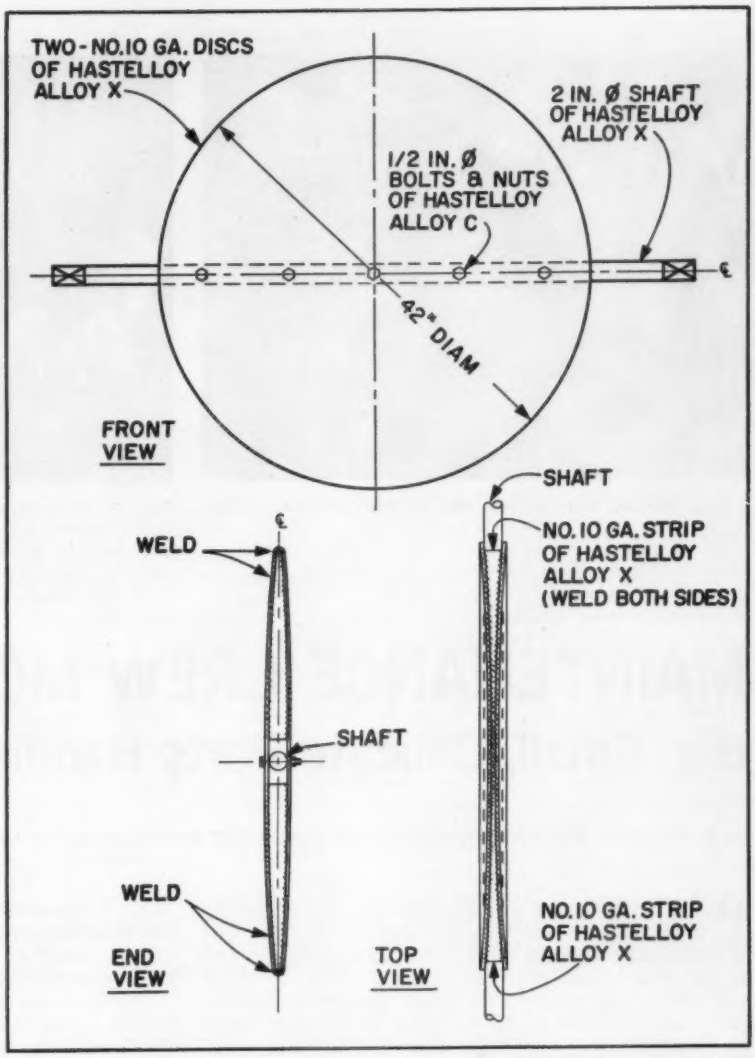

TWO - NO.10 GA. DISCS OF HASTELLOY ALLOY X
2 IN. Ø SHAFT OF HASTELLOY ALLOY X
1/2 IN. Ø BOLTS & NUTS OF HASTELLOY ALLOY C
42" DIAM
FRONT VIEW
SHAFT
NO. 10 GA. STRIP OF HASTELLOY ALLOY X (WELD BOTH SIDES)
WELD
SHAFT
WELD
NO. 10 GA. STRIP OF HASTELLOY ALLOY X
END VIEW
TOP VIEW

Fig. 2. Drawing above gives details of construction of new damper made of Hastelloy alloys. Old dampers lasted three months; new one still in service.

Fig. 3. Flash dryer, indicated by arrow, is located on the plant's ground floor.

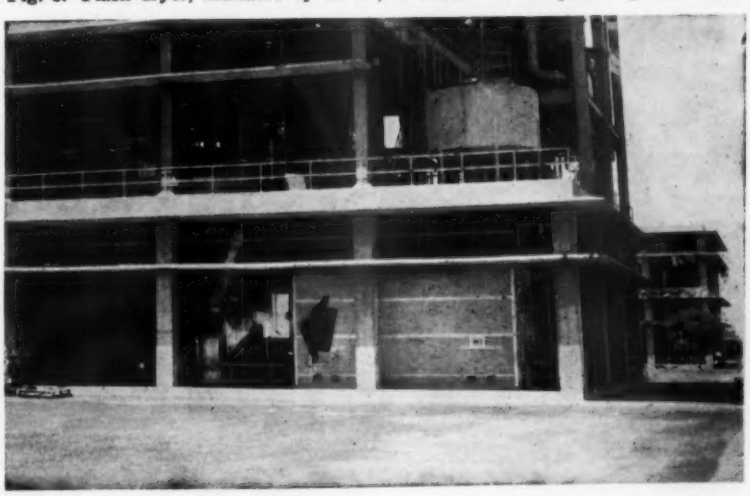


Fig. 1. Bearing test machine was the heaviest item moved.

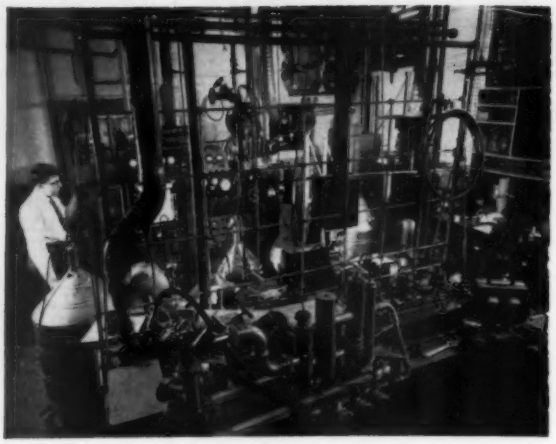


Fig. 2. Six men took four weeks to move this cryostat.

MAINTENANCE CREW MOVES LAB

Big, Small, Delicate Parts Handled With Care

By P. NORELLI, Superintendent, Facilities Department, Westinghouse Electric Corp., Pittsburgh, Pa.

PLANT MAINTENANCE was delegated the responsibilities of move-in, installation, and occupancy of the new Westinghouse laboratories at Churchill Borough as well as the planning and work necessary to move out of the old laboratories in East Pittsburgh. The Plant Maintenance group is part of the Facilities Department which also contains the Apparatus Construction Group—involving the machining and electronics wiring functions.

Our move-out effort consisted of (1) disconnecting mechanical and electrical services from research apparatus, equipment and laboratory furniture, (2) loading disconnected apparatus and furniture on dollies and (3) moving same to: (a) the shipping platform or (b) to the carpentry shop.

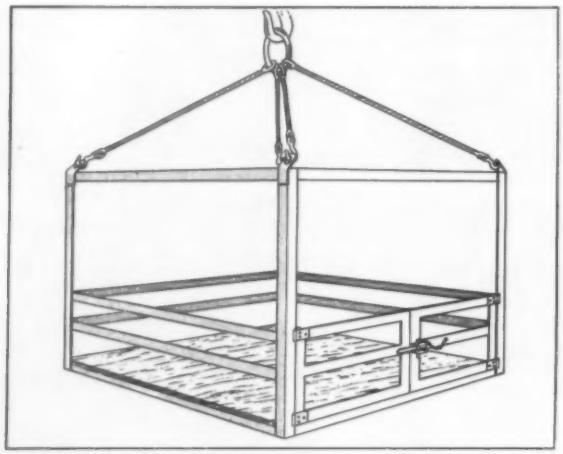


Fig. 3. Bird cage helped on "move-out" from the penthouse.

The material on the shipping platform would be picked up the next day by the trucking contractor and delivered to the designated room in the new laboratories. The laboratory furniture which had been delivered to the carpentry area was rebuilt to the modular standards necessary to functionally fit the new laboratory rooms. After this rebuilding, the laboratory furniture was reloaded on the trucker's dollies and rolled to the shipping platform.

Carpentry effort essential to the rebuilding of laboratory furniture was carefully scheduled. We made our own schedule board, consisting of 200 clip springs mounted on a 4-ft by 8-ft plywood board. We used a 4-in. by 6-in. envelope containing work information and pencil sketches for the carpentry group.

Each job was estimated and scheduled on our "home-made" board according to starting date. We rebuilt 400 to 500 pieces of laboratory furniture at a cost of approximately $18,000; it would have cost $50,000 to replace these items. In addition, we kept our carpentry crew intact for the herculean task of installation at the new site.

Our maintenance group handled about 50,000 pieces of equipment, some as heavy as 15 tons and others so delicate that they were moved to the new quarters in the lap of a technician. The heaviest item moved was a bearing test machine, Fig. 1, weighing about 15 tons. It was dismantled, moved piecemeal, and reassembled at the new site. The heaviest item moved as a single

unit was a high voltage transformer, 11 ft high and weighing over 7 tons. One of our difficult problems was posed by a three-ton magnet; it was slung from a second-floor window and lowered by crane to the mover's truck.

Another difficult task involved the "move-out" from roof-top penthouses. We constructed a "bird cage" large enough to house two dolly loads; in this manner we lowered approximately 80 dolly loads from the rooftop by means of a 40-ft boom crane. See Fig. 3.

Eighty-five per cent of the laboratory equipment was moved on different types of dollies. Flat dollies were used to move office furniture; hamper type dollies were used to move books, chemical glassware, instrument cases, and all other packable items. Felt-lined hamper dollies were used on the more fragile items. Heavy duty dollies were used on light and medium weight machine tools. This was truly a move on wheels—thus minimizing the effort of lift, drag, push or carry.

One giant task was the removal and reinstallation of the laboratory's cryostat. The cryostat, Fig. 2, is a research apparatus capable of plunging temperatures to some 450 F below zero. Used purely for research purposes, the cryostat weighs 6000 lb, occupies the space of two average kitchens and requires about 1000 ft of plumbing and wiring. It required six men some four weeks just to disconnect and reconnect it.

After we finished the move, were we through? Had the Plant Maintenance group overcome its toughest hurdle? I should say not! We faced the difficult and formidable task of reconnecting and installing most of the 50,000 pieces we had moved. In order to do this, we had to bring a large percentage of the electrical and mechanical services from their distribution centers into the occupation areas.

As a result of the move, plus subsequent occupancy and installation efforts, and the increased area of buildings and grounds, our Plant Maintenance group experienced unusual growth. We doubled the maintenance force from Jan., 1955 to Oct., 1956. See Fig. 4.

A reason that our personnel need continues at a high level is because of the occupancy rearrangement program. A typical occupancy project is shown in Figs. 5 and 6, before and after. Figure 5 shows the room during construction with a "behind-the-wainscot" scene to indicate the extent of mechanical and electrical services made available to every laboratory room. Figure 6 shows the laboratory with all the facilities in place.

Another reason we continue to require as many

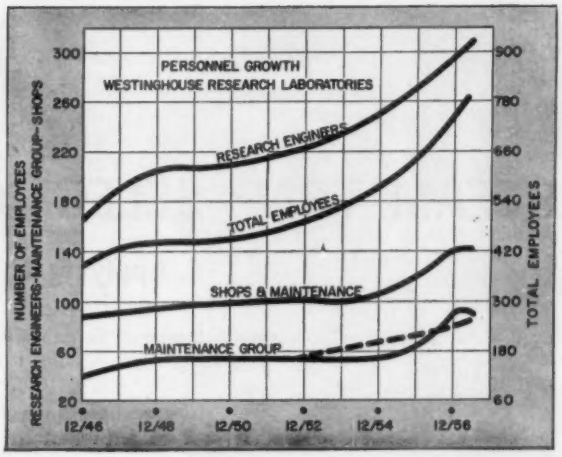


Fig. 4. Comparison of lab personnel to maintenance crew.

people as we have in our maintenance group is because of new and larger research equipment installations made possible by the more adequate space available in the new building. An example of this is a water tunnel which was completely assembled, fitted, plumbed, and wired by the tradesmen in the maintenance group.

Still another reason for an expanded maintenance group is the work of installing essential building equipment left out of the original building contract because of budget considerations. Just one example of this is the installation of an additional 100 tons of refrigeration capacity for our air conditioning system.

The curve sheet, Fig. 4, compares the expansion of our professional personnel (research engineers) with the total employee growth and with the growth of our maintenance group. Projecting a dotted line curve based on the ratio of research engineers to maintenance personnel for the constant period between 1948 and 1951 suggests that the maintenance group (excluding supervisors) should now total 88. Our present non-supervisory force actually numbers 91.

Our force of electricians will change through the medium of transfers; however, we will have to increase our janitorial force from 19 to 21 people. Magically enough, the maintenance group would then total 88 workmen. **End**

Fig. 5. Maintenance crews connected services for each lab.

Fig. 6. View of one of the labs with all equipment in place.

STEAM TRAP SELECTION CHART

6. Applying The Trap Safety Factor

By WM. G. STEINMILLER, Research Engineer, Yarnall-Waring Co., Chestnut Hill, Philadelphia

ONCE THE CONDENSATE load on a trap is determined a safety factor must be applied before the trap capacity can be chosen. Safety factors vary with the type of trap being used and the type of equipment it serves.

The factor takes care of a number of items which cannot be controlled too readily in trap application. These include variations in the steam pressure, discrepancies between assumed and actual data (the latter is rarely accurately known) and unpredictable or abnormal operating conditions.

Typical safety factors for impulse-type traps vary between 2 and 5. A factor of 2 is generally used for submerged coils discharging to gravity, and for pressure vessels. Dryers, pipe coils in air, and submerged surfaces draining to a trap located above the surface take a factor of 3. Coils over which air is forced by a fan usually take a factor of 5.

Follow the catalog recommendations for the type of trap under consideration when choosing a safety factor. The chart has been constructed for factors ranging between 1 and 10. This permits its use for any trap built today.

Example: The condensate load on a heater is 2000 lb per hr. What capacity trap should be chosen for this heater if the manufacturer recommends a factor of safety of 1.5?

Solution: Enter the chart on the left at the condensate load of 2000 lb per hr and draw a straight line through the factor of safety of 1.5 on the right. At the intersection with the central scale read the required trap capacity as 3000 lb per hr.

Before choosing a trap it is important to determine the temperature base on which the catalog capacity tables are based. Since the trap capacity decreases with a rise in the condensate temperature, the lower the temperature base, the higher the factor of safety must necessarily be.

This chart is used on the relation: $Y = CF$, in which Y = trap capacity, lb per hr; C = condensate discharged by the device, lb per hr; F = factor of safety recommended by the trap manufacturer.

If desired, you may enter the chart on the right at the factor of safety and find either the trap capacity or condensate load, if either of these is known. **End**

Fig. 1. Any two of the three pertinent factors can be used to get the unknown.

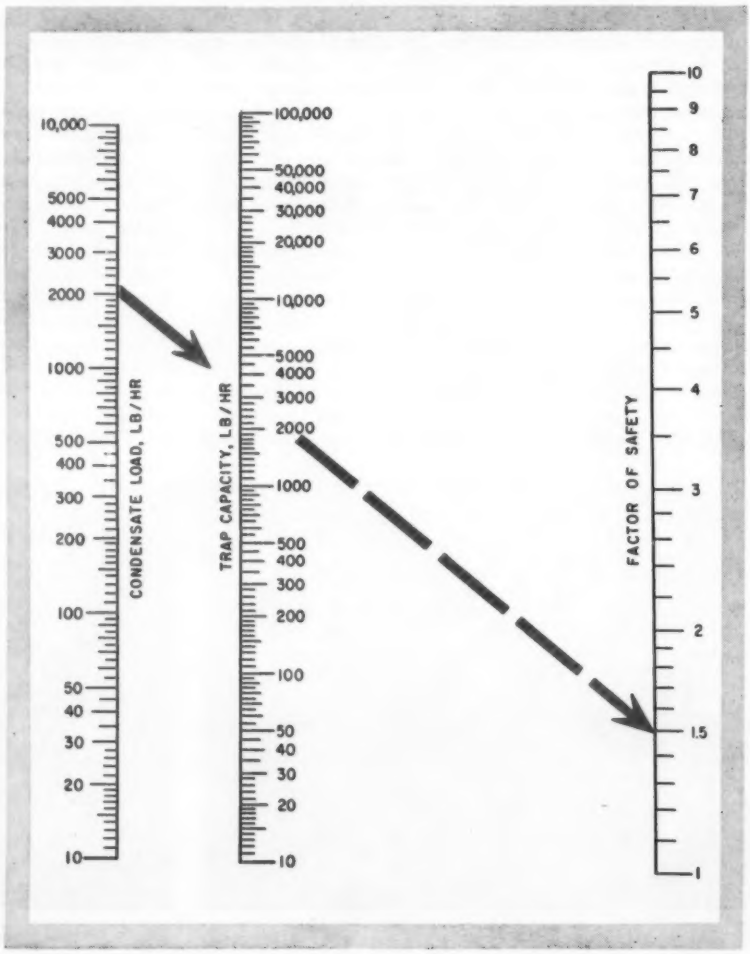


Fig. 1. Bank of five 10-gallon accumulators, background, is used as a secondary source of power for the molding press to provide reliable, uniform pressure for making records.

ACCUMULATORS SAVE $12,000

Hydraulic Control Improved—Downtime Reduced

SMOOTH OPERATION of compression and injection machines in the manufacture of popular phonograph records is important. Columbia Records engineers at Bridgeport, Conn., feel they have obtained such an objective by installation of hydro-pneumatic accumulators in the hydraulic pressure system. To date, this equipment has reduced downtime and rejections have been lowered by 25 per cent.

Control of hydraulic pressure to eliminate surges and pulsations is essential in the production of high quality records in which the microgrooves with 90 degree angles have a range of 1 to 1½ mils. Reduction of downtime due to failures in the hydraulic system has effected savings estimated at more than $12,000 a month.

Bladder type hydro-pneumatic accumulators, manufactured by Greer Hydraulics, Inc., of Jamaica, New York, have been installed on the hydraulic systems used in operating the compression molding presses and the injection molding machines.

L. C. Reed, chief of plant engineering, reports that with the use of these accumulators in the manifold installation at the beginning, center and end of each pressure line, there has been no downtime due to hydraulic system failures. The new accumulator installation includes the use of twenty 10-gallon and three 2½-gallon units.

Bladder type accumulators are essentially fluid pressure storage chambers in which the potential energy of an incompressible fluid under pressure can be stored against some

Fig. 2. This bank of ten 10-gallon accumulators is used to maintain the proper line pressure in the hydraulic pumps.

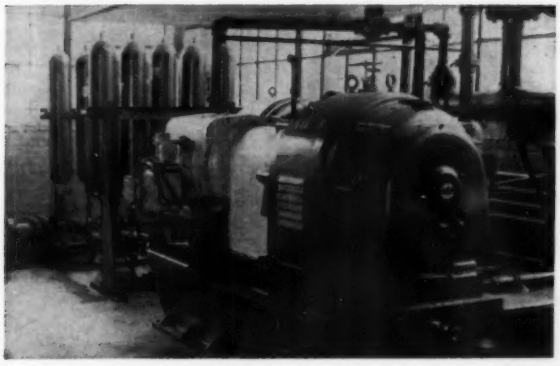
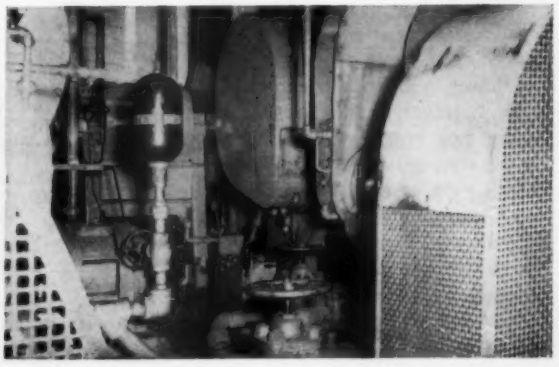


Fig. 3. A 2½-gallon accumulator is used in the plant's central powerhouse as a pulsation damper on triplex pumps.



dynamic force to do the useful work.

They consist of cylindrical steel shells containing elastic synthetic rubber bags or bladders which keep the fluid in the hydraulic system separate from nitrogen gas in the bags. The compressibility of the gas enclosed in the elastic bag is used as the dynamic force.

By storing fluid energy for instantaneous use when the system calls for it, the accumulator serves to smooth out pressure surges and prevents shock from developing in the system.

The three small accumulators and two of the large ones are used in the plant power house where pumps generate 2700 lb of water pressure for the hydraulic system. These accumulators, installed at the beginning of the pressure line, take the shock out of the line at the source. They provide a cushioning effect for the surges and pulsations of the high pressure pumps, especially during the loading and unloading.

Other accumulators in the middle and at the end of lines serve to balance hydraulic energy demands in the operation of the compression molding presses, working at 100-ton pressure. The accumulators, serving as energy balancing units, are used to assure equal pressures within 50 lb in the operation of some 160 presses.

Similar stability in control of hydraulic pressure is provided by accumulators on the 2700-lb oil pressure lines used on the injection machines.

In both lines, according to Mr. Reed, the manifold use of these accumulators serves to insure continuous pressure and flow of hydraulic energy which, in turn, prevents starvation of presses due to lack of hydraulic energy, which would cause a poor product.

With more stable control of hydraulic pressure, better impressions are obtained, there are less non-fills and fewer rejects. Most important of all, however, is the fact that any one or any group of accumulators can be replaced or repaired without affecting the system's operation.

As a result of the effective performance of these accumulators in the Bridgeport plant, the company is installing them in its plants in Terre Haute, Indiana, Los Angeles and Mexico City. **End**

EIGHT USES OF ACCUMULATORS IN HYDRAULIC CIRCUITS

1. **Pressure storage**—as an auxiliary source of energy in intermittent duty circuits where the cycle time will allow a change to be stored for peak requirements.

2. **Secondary circuits**—as a means of operating secondary circuits when the cycle requirements permit storage of sufficient fluid energy.

3. **Emergency operation**—as an emergency source of fluid power to complete work cycles in case of pump failure.

4. **Pressure-volume compensator**—as a means of maintaining constant pressure by absorbing and expelling hydraulic fluid where a ram must return to a given position after it has been displaced from its position.

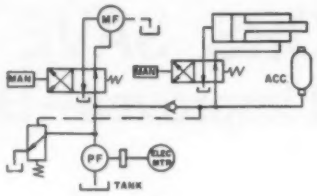
5. **Shock absorber**—as a shock absorber or surge chamber to reduce pressure peaks and smooth out pulsations.

6. **Leakage compensator**—as a leakage compensator for pressure regulated power systems and pressure holding operations.

7. **Transfer barrier**—as a pressure transfer agent where a flexible barrier is needed between two fluids or a gas and a fluid.

8. **Fluid dispenser**—as a fluid dispenser that supplies fluid as needed after a charge has been stored.

Note: Accumulators can also be used as thermal expansion compensators to take up excess fluid during a thermal expansion process.



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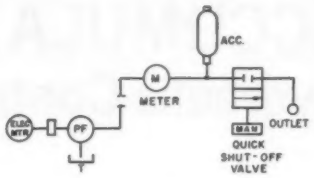

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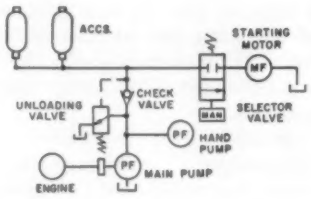

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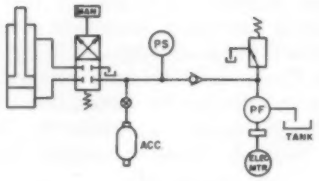

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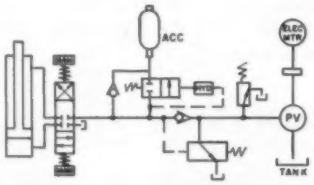

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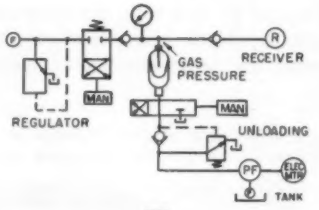

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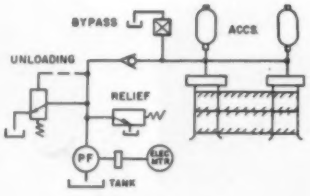

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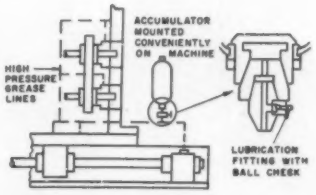

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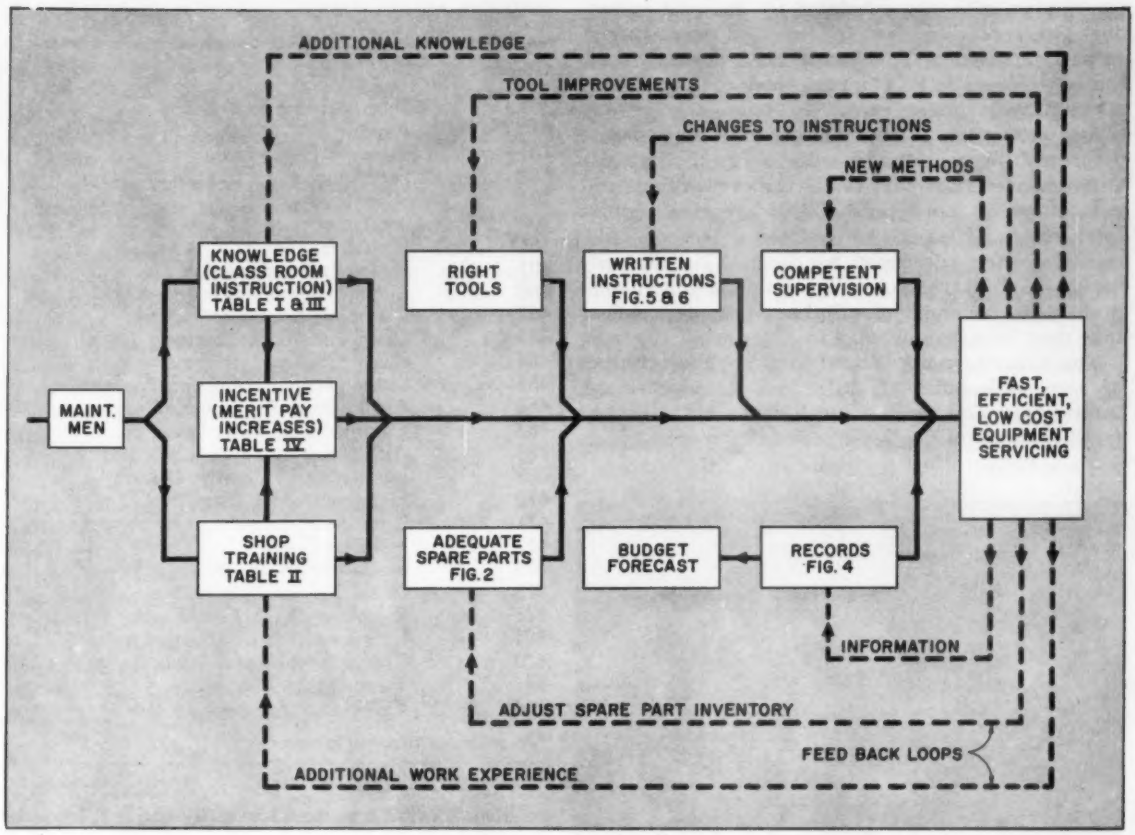


Fig. 1. Block diagram shows components of maintenance program. Informational feedback, dotted lines, improves system.

GROUNDWORK OF GOOD MAINTENANCE—

Trained Personnel, Preliminary Planning

By L. J. BRASHER, Plant Engineering, Transportation and Traffic Services, Ford Motor Co., Dearborn, Mich.

MAINTENANCE PLANNING on material handling equipment begins at the time it is being studied for purchase. Conferences are held with the transportation engineering section and the maintenance supervisory group to determine special problems that may develop in the proper maintenance of the equipment.

One of these problems is the review of current training programs to see what material will be needed to insure a supply of trained maintenance personnel. In addition, instruction manuals, check sheets and record cards are prepared to simplify inspections and repairs. Special tools required are ordered and spare parts reviewed to determine what new parts must be added to the inventory.

Special attention is given to the engineering design of each type of equipment. Careful records are kept on each maintenance and repair job performed. These records furnish a time standard for various types of maintenance and repair operations that occur frequently or are repeated on a definite cycle. Studying this material, it was found possible to set up standard methods and assignment of hours to do a particular job.

Following the findings of the time these particular tasks required, it was feasible to set up a standard covering all the periodic inspections and repairs of frequent occurrence and establish standard hours for heavy repair operations.

Annual budgets can be made up on every type of equipment in operation based on the number of periodic inspections required. This includes daily, weekly, semi-monthly, monthly, quarterly, half year and annual inspections as well as three or four year overhauls on the complete machine. The application of this principle allows the budget to be based on

the number of hours scheduled for periodic inspections plus an allowance for unexpected repairs based on past experience. This yearly total, in man hours, can be assumed to be a fair measure of the requirements for the coming year.

Any attempt to set up this program and operate it successfully would meet with failure if particular attention were not paid to the supervisory personnel. Many of the details of this program require knowledge and experience coupled with good judgment for their successful handling. This can only be obtained by careful training and a fairly comprehensive coverage of all the types of problems that may be encountered.

The supervisor is required to direct the activities of men with different skills such as electricians, millwrights and engine mechanics. He must be familiar with tolerances allowed on moving parts

Fig. 2. Locomotive crane used in an outdoor storage yard, typical of equipment serviced under planned maintenance.

and safe limits of cables, and friction lining materials.

Supervisors are appointed, after approval by the Personnel Development committee, and are given a six months' management training course. This consists of lecture and class room instruction on all phases of work in the automotive industry. Subjects covered include human relations, application of the U. A. W. contract, quality control, production machines and processes, uses of tools and methods, safety rules, and economics. Other courses cover time studies, material control, organization of the company, personnel problems, personal development, budget preparation and budget control. At the finish of these courses the trainee is given a grade and rating on the application and degree

Table I. Schedule of courses required for diesel repairman.

Course No.	Title
1.1	Shop Arithmetic I
2.1	Algebra
101	Blueprint Fundamentals
103	Ford Mechanical Standards
301	Shop Theory I
302	Shop Theory II
355	Fuels & Ignition
401	Hydraulic Fundamentals
460	Diesel Fundamentals
462	Diesel Air & Exhaust Systems
463	Diesel Fuels & Fuel Systems
464	Diesel Cooling Systems
465	Diesel Lubricants & Lube. Systems
466	Air Brakes & Air Control Devices
467	Electrical & Auxiliary Power Equip.
468	Alco Diesel*
469	International Harvester Diesel*
470	General Motors Diesel*
471	Caterpillar Diesel*
472	Hercules Diesel
473	Diesel Engine Theory
475	Diesel Service & Insp. Methods
476	Diesel Service & Insp. Forms
501	Characteristics of Metals I
502	Characteristics of Metals II
541	Elem. Physics I*
804	Orientation for Apprentices

*Program equivalent to 32 terms.

of his attention and mastery of the subject material presented.

Each week during his career as a supervisor he will attend a one-hour management class to receive information and data on all factors that would be of value to him. This will continue for the length of his employment as a supervisor.

Equal attention is given to training the men who will actually do the work. Studying personnel requirements for a program where individuals will be required to handle a wide variety of daily assignments on all types of heavy equipment, it was found necessary to set up a training course to meet the particular needs of the situation.

This program is designed to develop competent mechanics through the application of knowledge gained in classroom study and specialized work experience. Tables I and II outline the requirements of this training program extending over a four year period. Table III lists textbooks and other material

Table II. Varied work program rounds out classroom study.

Machine Shop	1000 Hours
Diesel Engine Rebuilding	1250 Hours
Diesel Locomotive Overhaul & Repair	1200 Hours
Locomotive Crane Overhaul & Repair	1200 Hours
Fuel & Lubricating Oil Systems	350 Hours
Service & Inspection	1050 Hours
Field Service	950 Hours
Optional: Bulldozers and other Equip.	1000 Hours
Total	8000 Hours

Table III. Text book list indicates thoroughness of training.

Diesel
Adams, "Diesel Operation & Maintenance," 1946, Courses 475, 476
"Audel's Diesel Engine Manual," 1953, Course 460
Bureau of Naval Personnel, "Diesel Engine Maintenance Training Manual," Course 462
ICC-"Laws and Rules for Inspection & Testing Locomotives," Courses 475, 476
Diesel Equipment Manufacturers Maintenance Manuals, Courses 468 to 473

Hydraulics
Bureau of Naval Personnel, "Basic Hydraulics," 1951, Course 401
"Hydraulics as Applied to Machines," Course 401

Mathematics
Pisani, "Essentials of Strength of Materials," Courses 41.1, 41.2
Wolfe & Phelps, "Practical Shop Mathematics," Courses 1.1, 2.1

Metallurgy
Taffel, "Visualized Physics," Course 541

Shop Theory
Wagener & Arthur, "Machine Shop Theory & Practice," Courses 301, 302
Wagener & Arthur, "Workbook for Machine Shop Theory & Practice," Courses 301, 302
Frazee & Bedell, "Automotive Fuel & Ignition Systems," Course 355

Welding
Althouse & Turnquist, "Modern Welding Practice," Course 264

to be used during the class room instruction period.

Merit increases, during the training program, are based on both accumulated knowledge of the subject and related work experience. Each man knows that rate increases, Table IV, depend upon his performance in school and in the shop.

Trainees receive instruction in the proper use of all the basic tools common to their trade. Each man becomes experienced in the use of calipers, micrometers, exhaust analyzers, dial indicators, feeler gages, pressure indicators and standard hand tools.

Fig. 3. Understanding of hydraulic equipment and diesel engines is essential to fast servicing of bucket unloader.

Adequate stocks of spare parts are kept on hand to satisfy the needs of any normal repair job. This parts supply is replenished as used to insure having the right parts on hand when needed. Experience gained in repair operations is used to review the spare parts inventory to reduce stocking of items not needed.

Written instructions and check sheets on repetitive inspections and repair jobs are designed so that the work proceeds in an orderly manner and nothing is overlooked. The check sheet, Fig. 5, tells the maintenance man what to do and is arranged in sequence to avoid doubling back later.

An operations sheet, Fig. 6, tells the maintenance man what tools and parts will be required for the inspection and explains in detail every operation and how it should be performed. In the example shown, covering the electrical inspection of a diesel electric crane, the inspector is instructed to change brushes when wear exceeds a specified figure.

In order to keep the quality of maintenance and repairs up to a specified standard, each type of equipment and engine is written up in a manual.

Table IV. Basis for wage increases and training incentives.

Courses	Shop Hours	Incentive Earned
one	500	X
three	1000	X
seven	2000	X
ten	3000	X
fifteen	4000	X
twenty	5000	X
twenty-three	6000	X
twenty-eight	7000	X
thirty-two	8000	Graduates

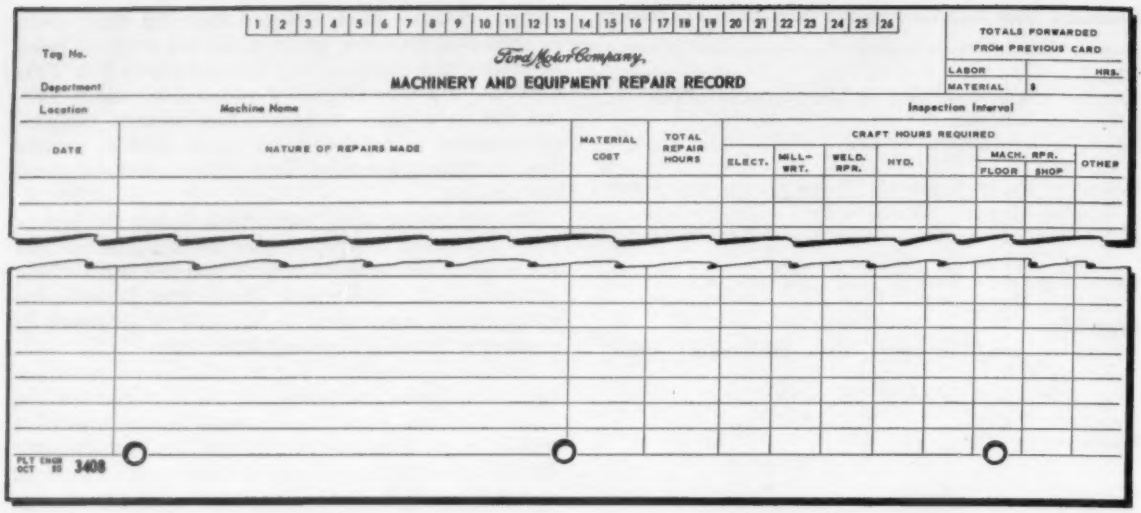
Note: Base rate is established by hourly wage administration

These manuals cover the interval between inspections, the time allocated, the methods to be used, the materials to be available and the assignment of skills or required scope and variety. The manuals also cover use of special jigs and fixtures, tool and shop labor, as well as cleaners. Lubricating oils, greases, cleaning equipment and the amount of each, where it is used and the intervals of application are also included.

When the equipment to be inspected or repaired arrives in the shop, the maintenance schedule clerk posts the inspection forms on it for guidance and record of all personnel performing the work. After completion of the inspection the unit is released, time and material recorded and any renewals of parts are entered in the equipment history file, Fig. 4.

Upon completion of a three-month period of service or the accumulation of 360 service hours the unit is scheduled for a quarterly inspection. All monthly inspection items are repeated with the addition of items determined by experience. Each year, or 1440 accumulated service hours, the unit receives its annual inspection.

It should be noted, however, that in most cases



Tag No. | Department | Location | Machine Name

Ford Motor Company

MACHINERY AND EQUIPMENT REPAIR RECORD

TOTALS FORWARDED FROM PREVIOUS CARD — LABOR HRS. — MATERIAL $

Inspection Interval

DATE	NATURE OF REPAIRS MADE	MATERIAL COST	TOTAL REPAIR HOURS	CRAFT HOURS REQUIRED: ELECT.	MILL-WRT.	WELD. RPR.	HYD.		MACH. RPR. FLOOR	MACH. RPR. SHOP	OTHER

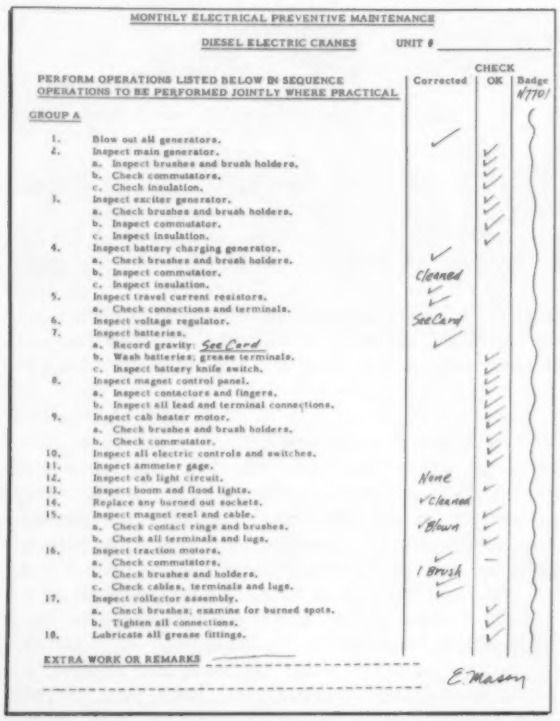
PLT ENGR OCT '55 3408

Fig. 4. Complete repair history is recorded on card and is used to evaluate spare parts program and predict labor hours.

the service hours are greater than this. The unit could conceivably accumulate 5724 hours in a calendar year under maximum utilization. Scheduling is done on a calendar basis, however, so that a regular pattern of shop work is available and to spread costs over a 12 month period.

If an hourly scale of 200 hours were used arbitrarily, some cranes would be getting 14 to 17 inspections during the year. This arbitrary scale is attractive at first glance but the calendar basis is giving the benefit of extra service hours without undue risk. However, the crane must be used a minimum of 120 hours a month in order to receive all items of the scheduled monthly inspection. Otherwise, field checks would be made. Not more than one monthly inspection is to be deferred.

Application of elements of this maintenance system eliminates costly down time delays to production machines and increases utilization of the equipment. **End**



MONTHLY ELECTRICAL PREVENTIVE MAINTENANCE

DIESEL ELECTRIC CRANES UNIT # _____

PERFORM OPERATIONS LISTED BELOW IN SEQUENCE
OPERATIONS TO BE PERFORMED JOINTLY WHERE PRACTICAL

CHECK: Corrected | OK | Badge #7701

GROUP A

1. Blow out all generators.
2. Inspect main generator.
   a. Inspect brushes and brush holders.
   b. Check commutators.
   c. Check insulation.
3. Inspect exciter generator.
   a. Check brushes and brush holders.
   b. Inspect commutator.
   c. Inspect insulation.
4. Inspect battery charging generator.
   a. Check brushes and brush holders.
   b. Inspect commutator.
   c. Inspect insulation.
5. Inspect travel current resistors.
   a. Check connections and terminals.
6. Inspect voltage regulator.
7. Inspect batteries.
   a. Record gravity: See Card
   b. Wash batteries; grease terminals.
   c. Inspect battery knife switch.
8. Inspect magnet control panel.
   a. Inspect contactors and fingers.
   b. Inspect all lead and terminal connections.
9. Inspect cab heater motor.
   a. Check brushes and brush holders.
   b. Check commutator.
10. Inspect all electric controls and switches.
11. Inspect ammeter gage.
12. Inspect cab light circuit.
13. Inspect boom and flood lights.
14. Replace any burned out sockets.
15. Inspect magnet reel and cable.
   a. Check contact rings and brushes.
   b. Check all terminals and lugs.
16. Inspect traction motors.
   a. Check commutators.
   b. Check brushes and holders.
   c. Check cables, terminals and lugs.
17. Inspect collector assembly.
   a. Check brushes; examine for burned spots.
   b. Tighten all connections.
18. Lubricate all grease fittings.

Corrected: ✓ | ✓ Cleaned | ✓ See Card | ✓ | None | ✓ Cleaned | ✓ Blown | ✓ | 1 Brush | ✓ | ✓ | ✓ | ✓

EXTRA WORK OR REMARKS _____

E. Mason

Fig. 5. Repairman checks each item. Nothing is overlooked and abnormal conditions are noted for future correction.

OPERATIONS SHEET

DIESEL ELECTRIC CRANE

ELECTRICAL MONTHLY INSPECTION

(All operations performed by Electrician)

PRELIMINARY MAKE READY

Electrician will go to crane with the following tools and equipment in tool tray:

1 - Extension light
1 - Air hose with nozzle
1 - Hand grease gun
1 - Hydrometer
1 - 3/8" box wrench
1 - 9/16 box wrench
1 - 5/8" box wrench
1 - 8" large screwdriver
1 - 6" small screwdriver
8 - 3/4" x 1 7/8" x 2 1/4" carbon brushes
2 - 3/8" x 3/4" x 1 1/2" carbon brushes
2 - 250 watt, 32 volt lamps
2 - 200 watt, 32 volt lamps
2 - 25 watt, 32 volt lamps
5 - clean wiping rags

OPERATIONS

1. Unclamp and remove covers from main generator.
2. With engine running, blow out main generator.
3. Direct air across commutator to remove dirt from between segments (main generator).
4. Wipe all insulation clean.
5. Inspect all bands (main generator).
6. Inspect brushes (if 1 1/8" long, replace). To replace use 3/8" box wrench; remove cap screw, lift spring and remove brush. Install new brush, lower spring on brush, insert cap screw in pigtail and secure to brush holder with 3/8" box wrench.
7. Wipe off cover and lock in place.
8. Remove 4 screws from each cover with screwdriver and remove covers from exciter generator.
9. Blow out exciter.
10. Inspect all bands.
11. Inspect brushes (if 7/8" long, replace). To remove brushes use 6" screwdriver; remove screw holding pigtail to brush holder, lift spring, remove brush. Insert new brush, lower spring on brush, insert screw in pigtail and secure to brush holder with screwdriver.
12. Install covers. Install screws secure with 8" screwdriver.
13. Remove cover from battery charging generator using 8" screwdriver to remove two 1/4" screws.

Fig. 6. Operations sheet furnishes detailed instructions on how to perform operations required in inspection procedure.

Using a filter with a 50 per cent transmission factor illustrates effects of dust and dirt on a lighting system. Power costs remain constant whereas the amount of light available is dependent upon lamp age and condition of reflecting surfaces.

CLEAN LIGHTING PAYS OFF FAST

Pennies Buy 100 Per Cent More Light

By E. A. LINSDAY, Industrial Lighting, General Electric Company, Cleveland, Ohio

LUMEN DEPRECIATION of industrial lighting systems occurs so gradually that few persons are aware of the lowered efficiency resulting from inadequate maintenance. When a lighting system is installed, certain costs become relatively fixed in the operation of the system. Capital invested in the lighting installation generally is written off, on a monthly basis. Power costs are a monthly expense that is fixed by the amount of equipment installed. Lamp costs vary widely through the first few years and then settle down to an average figure somewhat dependent upon the burning hours. All these costs represent a relatively inflexible figure that becomes the fixed cost of lighting.

How much light you will get for the amount of money invested in equipment, power and lamps will depend upon how well the installation is maintained. Here is a variable cost that is relatively small compared to the total, but which can exert a powerful influence upon the total cost of light.

Many plants install lighting systems that provide very adequate illumination. However, after several months, the footcandle level is down to one-half to two-thirds of the initial values. The majority of these wasted footcandles can be saved, with a planned maintenance program.

The trend in industry has been toward higher lighting levels and this makes it even more important to insure that the lighting installation produces maximum illumination at lowest cost. Preparation and planning of a lighting installation should include a program for lighting maintenance. A planned program insures that management will receive the light for which it pays.

A good cleaning program is a profitable investment. Dirt absorbs light. Cleaning removes the dirt and thus increases the lighting level. Visibility is improved, resulting in increased production and reduced rejects.

Cleaning the lighting system at the most economical time makes

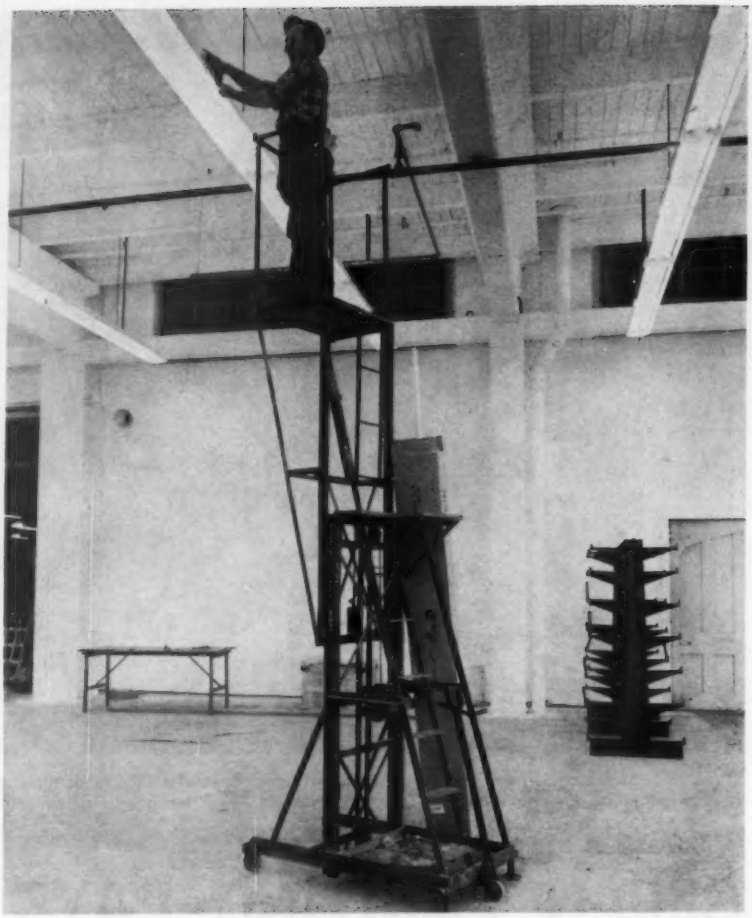
use of the most efficient methods and equipment. In this way the time and materials required are reduced and maintenance costs are lowered. Clean lighting fixtures improve the appearance of the working area. This is conducive to improved employee morale and better housekeeping.

Dirt on lamps and fixtures causes the greatest loss of light. It is not uncommon to have light losses of 30 per cent due to dirt alone in industrial areas. Just how much light will be lost depends upon the kind of dirt in the area, fixture design, lamp type and fixture finish.

Fixture design affects the rate at which dust and dirt collects and proper care should be exercised to select a fixture which is suited to the application. Units with openings in the top tend to collect dirt less rapidly than those with closed tops. Field tests have shown that ventilating slots, cut into the upper part of reflectors, materially reduce the rate of dirt accumulation. Similar advantages are obtained with fluorescent fixtures with upward light, such as the new types of industrial fixtures.

Dirt accumulations on reflecting surfaces can also be reduced if the reflector is sealed from the air, as in a dust tight fixture or reflector lamp. The effect of dirt accumulation on the light output of reflectorized lamps is minimized since the reflector is sealed inside the lamp.

The color-improved mercury lamp utilizes a phosphor as a reflector to direct approximately two-thirds of the light downward. Since the phosphor is on the inner surface of the bulb, these lamps have good maintenance characteristics.



Constantly recurring maintenance of lighting and other overhead equipment results in rapid return on maintenance aids like this portable, elevating platform.

Fixture finishes differ in their resistance to dirt accumulation. Processed aluminum finishes, while not as high in initial reflectance as the enamels, tend to have a slower rate of dirt accumulation. Enamels, on the other hand, are usually easier to clean.

General practice in all lighting fields is to use finishes on room surfaces with a high reflectance to balance brightness within the area and to utilize the light more efficiently. Dirty walls and ceilings tend to reduce the amount of reflected light. Thus while periodic cleaning and painting of walls and ceilings is necessary in all installations, it should be done more frequently in those areas where a large per cent of the light is reflected by these surfaces.

Light output of lamps decreases as they progress through life. This decrease is called lumen depreciation and is an inherent characteristic of all lamps. When a new lamp is installed next to an old one you can readily see this loss of light.

Ventilation can reduce the rate of dirt accumulation. Unit at left is not ventilated, center unit has small holes at top and unit at right has slots in the husk.

Time, labor and expense of maintaining a lighting system can be greatly reduced by choosing maintenance equipment with features most suitable to the requirements of each system. Many different kinds of maintenance devices are available to facilitate the cleaning task. Choice of equipment will depend on mounting height, size of area, accessibility of lighting fixtures and obstacles in the area.

Ladders are often used in lighting maintenance because their light weight, simplicity and low cost make them desirable equipment for simple maintenance tasks. Modifications of ladders can often be made to make them more useful. A combination ladder and cart makes it easier to transport the ladder and necessary equipment to the job. Attaching brackets, to help hold the ladder in position against a girder or other structural member, is useful.

Cleaning Equipment

Portable scaffolding generally has greater safety and versatility than a ladder. More equipment can be carried and the maintenance man has a firm platform upon which to work. Scaffolds should be light, mobile, sturdy, adjustable and easy to setup. More elaborate than the portable scaffold, the telescoping scaffold provides a quick means of reaching lighting equipment at a variety of mounting heights.

Often the quickest and most efficient maintenance device is the lift truck. Although there are many different types on the market, the method of operation of each is basically the same. An elevating platform is mounted on a mobile truck. The platform can be raised and lowered automatically and in some types the truck can be driven from the platform. In this type, the maintenance man does not have to leave the platform since all the equipment needed can usually be carried on the truck.

It is often a good investment to make the facilities for lighting maintenance an integral part of the lighting system. This can be accomplished in many ways. Fixtures can be maintained from catwalks which are built parallel to the rows of lighting units.

In high-ceiling industrial areas, cranes are often used for access to lighting equipment. Where this is done, it is often advisable to service the lighting after working hours in order to reduce work interruptions. In this case, maintenance costs may be higher because of overtime pay.

Maintenance cages, mounted on cable ways, are also effective maintenance devices. They can be installed along each row of fixtures with a carriage suspended from each cable to hold the maintenance man and equipment.

Monorail tracks and switches can also be used to permit easy maintenance of any component in the system. Many of these overhead maintenance systems are installed early in the construction program and are used to install the lighting equipment. Savings in lighting installation costs frequently pay for the system before the lights are turned on.

Equipment used for washing lighting fixture reflectors and louvers should be specially designed for this work. One type has separate tanks for washing and rinsing and also a rack to permit drip drying. Electric heating units are mounted in the tanks to keep the solutions at the proper temperature.

Every lighting maintenance program includes lamp replacements. Lamps can be replaced as they burn out, commonly referred to as spot replacement, or the entire group of lamps may be replaced before the lamps reach the end of their average life.

Group Relamping Saves Time

When a lighting installation is group-relamped at 80 per cent average life, 20 per cent of the best remaining lamps are set aside to use as individual replacements during the interim period before the next group relamping. These selected lamps are the ones with the brightest and cleanest ends when lighted. As lamps burn out, they are replaced from this stock of interim-replacement lamps. When the selected lamps have been used up, it is time to group relamp the entire installation and the cycle is repeated.

Group relamping saves on labor costs because much of the travel time and set-up time required to change lamps individually is eliminated. Labor cost per lamp with

Portable wash tank has separate compartments for wash and rinse water and a rack for drying cleaned parts. Tanks have heaters to maintain solution at proper temperature. Narrow width and large casters simplify use in crowded aisles.

Monorail cage system, installed during construction, is used to put up brackets for lighting fixtures. Continuous rows of fixtures mounted on both sides of each truss will be serviced from the cage. A transfer rail is shown at the extreme left.

group relamping generally ranges from one-fifth to one-tenth the spot replacement cost and seldom exceeds 20 cents per lamp for fluorescent lamps. As labor costs increase, group relamping becomes even more profitable as labor accounts for a large proportion of total maintenance costs.

When fixtures are group-relamped after relatively few have failed, costs are usually reduced considerably. All lamps depreciate in light output as they burn. If they are replaced before excessive depreciation, the maintained illumination will be higher without adding to the cost of electric energy or the number of lighting fixtures used. When these higher illumination levels are assigned the value they deserve in terms of work output, shorter group-relamping intervals can be economically justified.

Group relamping can be done during vacation shutdowns or after working hours when it will not interfere with operations. Black ends, color variations, and differences in brightness between old and new fluorescent lamps are common when spot replacement is used. With group replacement, all the lamps are the same age and appearance is far more uniform.

Abnormal operating conditions that may occur at the end of fluorescent lamp life can damage starters and ballasts. When most of the lamps are replaced before they reach the end of life, auxiliary equipment lasts longer.

Cleaning Doubles Light Output

Frequently, lighting levels can be doubled by a good maintenance program with only a nominal increase in lamp costs. Power costs, of course, remain the same. Here is a typical example. With spot relamping, lamp costs per year are $328.76 and power costs $1614, for a total of $1942.76. With group relamping, lamp costs increase to $438.44 and with the same power cost of $1614 totals $2052.44.

This is approximately five per cent more on the combined yearly bill for lamps and electricity but is well worth the cost when you consider the increased lighting available. With spot relamping and infrequent cleanings the lighting level averaged 63 ft-c. With group relamping and regularly scheduled cleaning the footcandle level just about doubled to 121 ft-c. As this is the design intensity, most efficient operation will be found at this point.

There was no increase in labor costs as the labor hours formerly used for spot relamping equal the hours presently used for both cleaning the fixtures and group relamping. The investment of five per cent more per year in lighting results in an average of 50 per cent more light during the year.

Good lighting is an essential tool of production. Higher levels of illumination result in greater accuracy, increased production and improved working conditions. A planned maintenance program is one way to make sure a plant will receive all the light for which it is paying and insure better seeing conditions and more efficient production. **End**

EXHAUST VENTILATION DESIGN— For Buffing, Polishing Operations

By JAMES C. BARRETT, Ventilation Engineer, Div. of Occupational Health, Michigan

ADEQUATE EXHAUST ventilation is necessary for polishing and buffing operations to remove air-borne dust, provide satisfactory cooling at the wheel and confine the large particles resulting from the operation.

Ventilation design for these operations is fundamentally the same as for any type of dust control system. There must be a suitable hood either of the self-cleaning design in which all the particles are carried into the exhaust system, or one with suitable traps to stop the larger particles. Ductwork must be designed to provide a balance of air flow between the operations to maintain minimum exhaust volumes at all hoods.

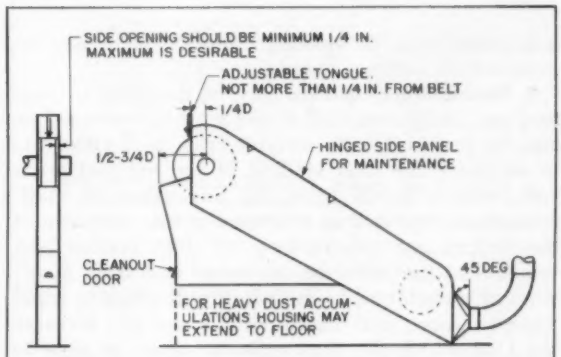
Transport velocity must be maintained to prevent dust particles from settling out in the ducts. Dust settling will result in excessive maintenance requirements for the system and may result in its complete failure. A dust collector must be selected on the basis of the amount of material present in the air stream, the physical characteristics of the materials and the degree of cleaning required. The fan must be able to exhaust the total air volume against the static pressure resistance of the hoods, ductwork and collector and must be of rugged construction to require a minimum of maintenance. The fan should be located following the collector to minimize abrasion and clogging.

Hood Design Has Three Functions

In selecting the hood to suit the particular operation, the designer must achieve a degree of enclosure which will not interfere with production operations, and provide the necessary exhaust volume for control of the material released.

1. **Enclosure**—Proper enclosure provides dust control with low exhaust volumes. In the case of polishing and buffing operations the rotating wheel acts as a fan and entrains large amounts of air, therefore the hood should confine the wheel and direct the induced stream of air into the hood. The use of an adjustable tongue at the upper edge of the hood will minimize the induced air stream and recent research indicates that closing the side space between the wheel and the hood will also reduce the induced air volume.

2. **Air Volume Control**—In the case of standard types of hoods printed data is available to relate exhaust volumes to the size of the wheel or belt. For certain operations, however, it may be necessary to provide an entirely different hood design which may be an open booth or side draft hood. In these cases air volumes must be calculated and are based on creating capture velocity at the point of dust generation.


SIDE OPENING SHOULD BE MINIMUM 1/4 IN. MAXIMUM IS DESIRABLE
ADJUSTABLE TONGUE. NOT MORE THAN 1/4 IN. FROM BELT
1/4D
1/2-3/4D
HINGED SIDE PANEL FOR MAINTENANCE
CLEANOUT DOOR
45 DEG
FOR HEAVY DUST ACCUMULATIONS HOUSING MAY EXTEND TO FLOOR

BELT WIDTH INCHES	EXHAUST VOLUME CFM GOOD ENCLOSURE *	EXHAUST VOLUME CFM POOR ENCLOSURE
1-1/2	220	330
2	390	600
3	500	750
4	610	920
5	880	1300
6	1200	1600

* HOOD AS SHOWN NO MORE THAN 25% OF WHEEL EXPOSED
ENTRY LOSS = 0.40 VP, 45 DEG TAKE-OFF
DUCT VELOCITY = 3500 FPM MINIMUM

Fig. 1. This is a typical exhaust hood for a backstand idler belt polisher that is used in high production polishing.

For side draft and open types of hoods, the formula derived by J. M. DalleValle is the one which should be applied; $Q = V (10 X^2 + A)$ where Q = cfm, V = fpm, X = distance from the face of the hood to point of dust generation in feet, and A = area of hood face, in square feet. It is most desirable to place the hood very close to the point of dust generation since the control velocity decreases approximately as the square of the distance. The use of side flanges or baffles will reduce the necessary exhaust volume by about 25 per cent. With the booth design it is desirable to place the grinding wheel inside, with the operator on the outside.

It is necessary to establish a flow of air through the booth at sufficient velocity to prevent the escape of dust. Face velocity will depend upon the amount of air set in motion by the wheel and also on the distance between the face of the booth and the wheel. For capture velocities see Table I, which

Table I. Velocity ranges possible in various operations.

Condition of Dispersion of Contaminant	Examples	Capture Velocity, fpm
Released with no velocity into quiet air.	Evaporation from tanks; degreasing, plating, pickling, etc.	50-100
Released at low velocity into moderately still air.	Spray booths; intermittent container filling; low speed conveyor transfers; welding.	100-200
Active generation into zone of rapid air motion.	Spray painting in shallow booths; barrel filling, conveyor loading; crushers.	200-500
Released at high initial velocity into zone of very rapid air motion.	Grinding; abrasive blasting, tumbling.	500-2000

is a compilation of velocity ranges which may be expected at various operations.

3. **Maintenance**—Hoods may be designed to capture and carry away all of the material released or may be provided with suitable traps and cleanouts to minimize the dust loading in the exhaust duct. Self-cleaning hoods have the advantage of minimizing maintenance at scattered points throughout the department, centralizing all dust control and removal at the collector. However excessive quantities of material in the ductwork will result in rapid wear at elbows and branch entries and will increase the load which the dust collector must be able to handle. In certain applications, such as the grinding and polishing of magnesium, titanium and other pyrophoric materials, the hood must be of a self-cleaning design and a dust collector must be located immediately adjacent to the hood. Many successful commercial designs are available in which the hood is an integral part of the dust collector to provide wetting and removal of the material as soon as possible.

Branch duct sizes must be determined from the type of hood and the volume of air being exhausted. Velocities must be maintained in the usual

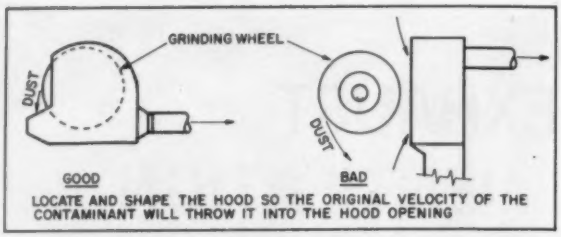

GRINDING WHEEL
DUST
DUST
GOOD
BAD
LOCATE AND SHAPE THE HOOD SO THE ORIGINAL VELOCITY OF THE CONTAMINANT WILL THROW IT INTO THE HOOD OPENING

Fig. 2. Good and bad design of enclosure and takeoffs. Note that "good" design provides amply for dust control.

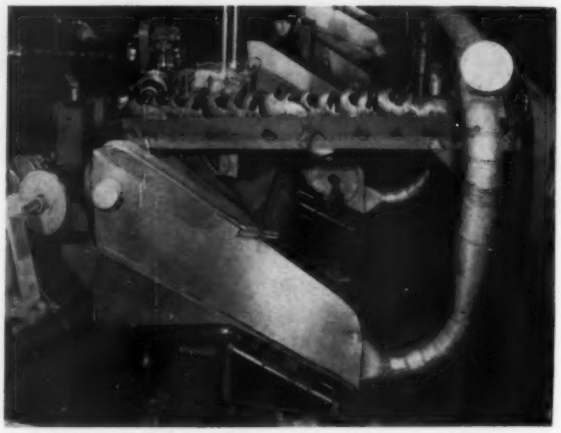


Fig. 3. Backstand idler (Fig. 1.) in automotive plant.

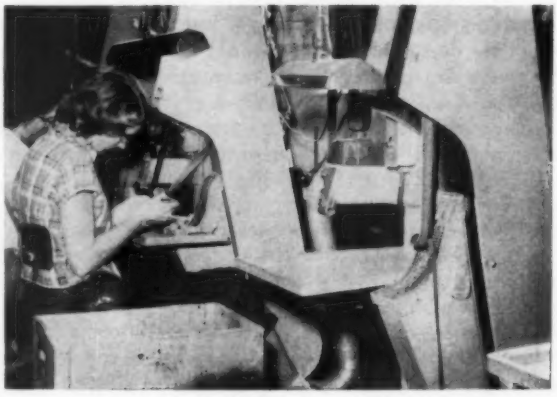
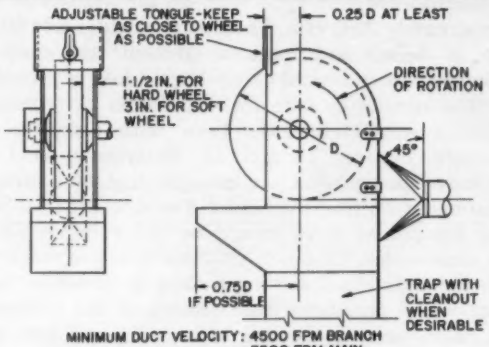


Fig. 4. Unusual hood design for a narrow belt polisher.

Fig. 5. This hood is a modified booth for a point grinder.


ADJUSTABLE TONGUE-KEEP AS CLOSE TO WHEEL AS POSSIBLE
0.25 D AT LEAST
1-1/2 IN. FOR HARD WHEEL 3 IN. FOR SOFT WHEEL
DIRECTION OF ROTATION
D
45°
0.75D IF POSSIBLE
TRAP WITH CLEANOUT WHEN DESIRABLE
MINIMUM DUCT VELOCITY: 4500 FPM BRANCH 3500 FPM MAIN
ENTRY LOSS: 0.65 VP FOR STRAIGHT TAKE-OFF 0.40 VP FOR TAPERED TAKE-OFF

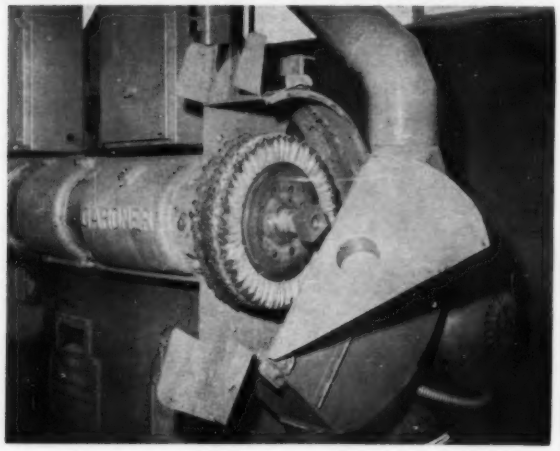
WHEEL DIAM INCHES	WHEEL WIDTH INCHES	EXHAUST VOLUME CFM	EXHAUST VOLUME CFM
		GOOD ENCLOSURE	POOR ENCLOSURE
TO 9	2	300	400
OVER 9 TO 16	3	500	670
OVER 16 TO 19	4	610	800
OVER 19 TO 24	5	740	1100
OVER 24 TO 30	6	1040	1400
OVER 30 TO 36	6	1175	1800

NOTE: IN CASES OF EXTRA WIDE WHEELS, USE WHEEL WIDTH TO DETERMINE EXHAUST VOLUME

Fig. 6. This is a standard hood for buffing. Removable panels facilitate both maintenance and wheel changes.

range of 3500 to 4500 fpm to minimize plugging of the ductwork at the wheel. When large amounts of compounds are used in buffing operations these duct velocities must be increased to as high as 6000 fpm to minimize plugging. Properly designed connections between the branch duct and hood are needed to minimize shock losses in the exhaust system and also to minimize or encourage the removal of large particles from the hood. The use of a tapered fitting will result in low shock losses and will result in a minimum pickup of material. A straight pipe connection will have the opposite effect on the hood design. Figure 2 illustrates good and bad features of enclosure and takeoff connections for a typical hood.

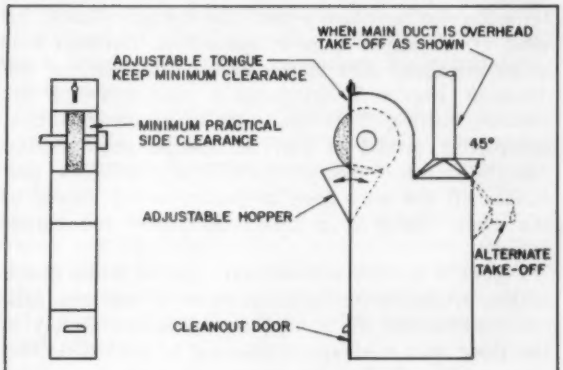
Fig. 7. This hood, for manual buffing, can be operated almost completely closed or can be opened for special work.



Select Hood for Job To Be Done

Manual Polishing and Buffing—The backstand idler belt polisher is used in high production polishing. Figure 1 shows a typical exhaust hood and the photograph, Fig. 3, shows a similar design in a Michigan automotive plant. Features include the adjustable tongue at the upper edge of the hood, the use of minimum side clearance between the wheel and the hood, and the enlarged bottom and hinged side panels for ease of maintenance. Also included is a tapered takeoff to minimize shock losses and material pickup.

An unusual design of an exhaust hood is shown in Fig. 4. Here the operation is the polishing of the inside curvature of turbine blades and a narrow belt polisher is used. The exhaust takeoff is directly below the lower pulley and is designed to capture the dust generated at this point. Design volumes range from 160 to 200 cfm with adequate dust control. However, improvement could be made by using side flanges at the opening.



WHEEL DIAM. INCHES	WHEEL WIDTH INCHES	EXHAUST VOLUME CFM
TO 9	2	400
OVER 9 TO 16	3	670
OVER 16 TO 19	4	800
OVER 19 TO 24	5	1100
OVER 24 TO 30	6	1400
OVER 30 TO 36	6	1800

NOTE: FOR WIDER WHEELS THAN LISTED, INCREASE CFM WITH WIDTH
DUCT VELOCITY—4500 FPM MINIMUM
ENTRY LOSS 0.40 VELOCITY PRESSURE FOR 45 DEGREE TAKE-OFF

Fig. 8. This hood makes provision for large amounts of fallout. It can be extended all the way to the floor.

Another different type of hood is that used with the bench-mounted small point grinder shown in Fig. 5. In this case the hood is a modified booth with the sides cut away to provide freedom of movement for the operator's hands. Good dust control is being accomplished with an exhaust of 170 to 225 cfm. Improvement could be made by installing a side baffle between the hood and the tool. Note the use of the screen to prevent miscellaneous materials from entering the duct, and the tapered takeoff to reduce shock losses.

Figure 6 shows a standard hood for buffing. Removable panels are used to facilitate maintenance

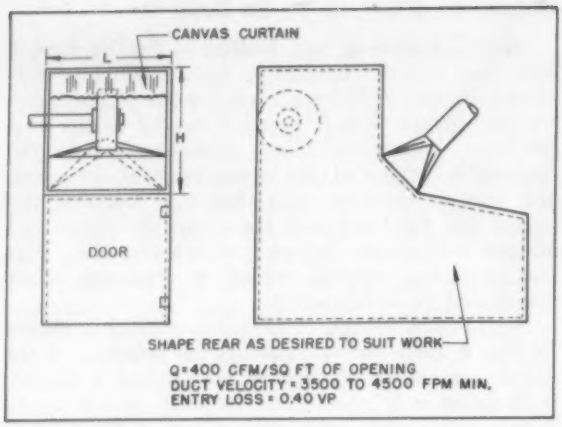


Fig. 9. This hood is used when polishing large pieces. Worked-on material is allowed to pass directly into hood.

and wheel changes. The bottom of the hood may be enlarged to collect large particles arising from the operation. Whenever possible the lower edge should be extended as shown and the tongue should be used at the upper edge of the wheel. Exhaust volumes are illustrated in the table accompanying the drawing. Figure 7 illustrates a unique design for manual buffing. This hood can be operated almost completely closed or can be opened considerably (as shown) for special work. The side door also hinges all the way back to permit ready access to the wheel. Here again a tapered takeoff connection is used.

Figure 8 illustrates a similar type of hood which makes provision for large amounts of material fallout. In this case the hood is extended completely to the floor and a cleanout opening is provided. The exhaust branch may be connected at the top of the hood as shown to minimize carryout. Or it may be taken off directly at the back when the main duct is located at or near the floor. With this arrangement a vertical baffle at least 1 diameter in front of the branch opening will minimize direct throw of the material into the duct.

In some cases it is not possible to provide a hood at the wheel alone to give adequate dust control and the entire operation must be enclosed. Figure 9 shows a design which is in use for polishing large pieces of automotive trim. In this case the trim material is allowed to pass directly into the hood. Canvas curtains are used to minimize a frontal opening and a velocity of 400 fpm is provided at the face. Cleanout doors and side panels are provided.

Automatic Buffing Presents Special Problems

Ventilation design for automatic buffing is a serious problem since the degree of enclosure is limited by the operation. Exhaust volumes up to 2000 cfm per wheel have been used with results that have been only fair. Air-borne dust can be controlled satisfactorily in most instances but there has been no control or confinement of the larger particles and compound. Figure 10 shows a typical application of this type with an air volume of approximately 2000 cfm. There is a considerable buildup of debris and material around the machine, however good control of air-borne dust is provided.

Best results to date for ventilation of automatic buffing equipment have been with complete enclosure. Figures 11 and 12 illustrate typical enclosures being used on straight line and circular automatic buffing machines. For straight line buffing equipment there should be one exhaust takeoff at each wheel. Common practice is to use ammeters on the individual driving motors in order to regulate wheel pressures from outside of the enclosure. A refinement is the use of a horizontal belt conveyor beneath the table to collect heavy material and convey this to a suitable tote box. A minimum air velocity of 150 fpm should be used through all openings in the enclosure.

For circular automatic buffing most installations have been made with an enclosure completely surrounding the machine. Access doors and operating openings are made in the sides of the enclosure. Multiple takeoffs are desirable. For small machines, however, single takeoffs have been used with success. Since circular automatic installations are quite large, it is most desirable to provide a sprinkling system or other type of fire protection since there will be a greater accumulation of flammable material between cleanout intervals.

Exhaust duct systems must be designed to provide a balance of air flow between the individual exhaust hoods, to maintain minimum carrying velocities in the ductwork, and to function with a minimum of maintenance.

Fig. 10. This is a local exhaust set up for automatic buffing. Good control of air-borne dust is provided but there is little control of larger particles or of buffing compound.

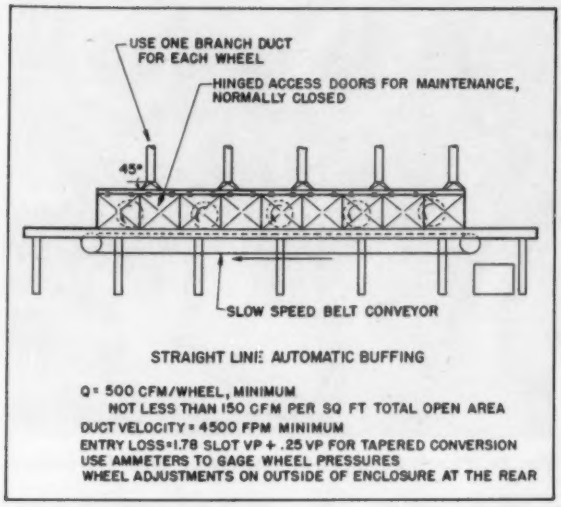

USE ONE BRANCH DUCT FOR EACH WHEEL
HINGED ACCESS DOORS FOR MAINTENANCE, NORMALLY CLOSED
45°
SLOW SPEED BELT CONVEYOR
STRAIGHT LINE AUTOMATIC BUFFING
Q = 500 CFM/WHEEL, MINIMUM
NOT LESS THAN 150 CFM PER SQ FT TOTAL OPEN AREA
DUCT VELOCITY = 4500 FPM MINIMUM
ENTRY LOSS = 1.78 SLOT VP + .25 VP FOR TAPERED CONVERSION
USE AMMETERS TO GAGE WHEEL PRESSURES
WHEEL ADJUSTMENTS ON OUTSIDE OF ENCLOSURE AT THE REAR

Fig. 11. This is one example of complete enclosure for an automatic buffing operation. This is a straight-line job.

Ductwork is usually provided in the form of graduated size main duct to provide minimum transport velocity in all sections. Balance may be obtained by so-called natural methods or by mechanical means such as blast gates. Natural balance design is preferred since design air flow will be maintained at all hoods as long as the entire system is maintained in good operating conditions.

Blast Gate Adjustment is Touchy

Blast gates have the disadvantage of maladjustment which may be caused by unauthorized persons tampering with the settings. Also the blast gate is an obstruction in the air stream and here is a chance of material buildup and plugging around such obstruction. Natural balanced design is obtained by correct sizing of duct diameter elbow radius or branch duct length in order to provide equal pressure drops between the main duct and the various operations. As stated earlier, minimum transport velocities usually range between 3500 and 4500 fpm with occasional severe applications requiring air velocities up to 6000 fpm.

For a good exhaust system elbows and branch entries must be selected and installed carefully. Streamlined flow is necessary in an industrial exhaust system since duct velocities are so high. In comparison with residential or commercial heating and air conditioning systems, industrial exhaust velocities are from 5 to 10 times higher. Since resistance and shock losses increase with the square of the increase in air velocity, there is a tremendous difference between the static pressure losses in an industrial system and in a heating system.

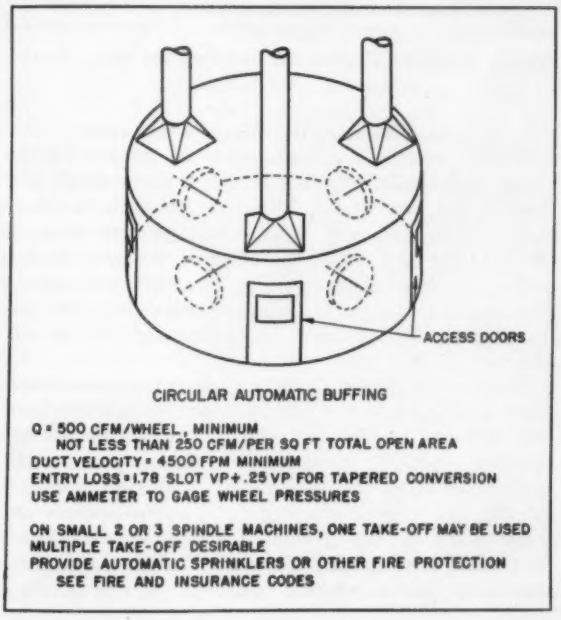
For these reasons elbows should be of generous centerline or throat radius and branch entries should be made at streamlined angles not to exceed 45 degrees. A good elbow will have a centerline radius equal to 2 or 2½ diameters of duct. (Throat radius of 1½ to 2 duct diameters). Branch entries should not be directly opposite each other due to the increased turbulence which results. This turbulence will result in excessive wear in the main duct and may also cause settling of material. Figure 13 illustrates good and bad practice in duct design and the photograph, Fig. 14 shows a typical good design in industry.

Cleanout openings should be provided in the main ducts in the vicinity of entries and elbows and a cleanout should always be installed at the end of the system to facilitate inspection and cleaning. In straight runs of ductwork, cleanouts should be installed on 10 ft centers for convenience.

Good duct design includes not only the physical layout of the system but also an accurate pressure loss determination for the ductwork, hoods and collector in order that the fan may be selected properly. Various methods of calculating exhaust systems are in use. Two popular methods are based on either the equivalent foot resistance of the ductwork and fitting or on the method of relating all losses to the velocity pressure of the air flowing in the system. A convenient method is that which is outlined in the Industrial Ventilation Manual which tabulates a simple procedure for calculating system losses.

Pressure losses include (a) the necessary energy to accelerate the air from zero velocity and zero static pressure at room condition to the velocity in the exhaust hood and duct, (b) the frictional loss of the ductwork, and (c) dynamic loss in branch entries, elbows and dust collectors. Accurate pressure loss determinations must be made in order to permit the designer to select a fan, the performance of which will lie in its maximum efficiency range.

Fig. 12. For circular automatic buffing most installations are made with complete enclosures and multiple takeoffs.


ACCESS DOORS
CIRCULAR AUTOMATIC BUFFING
Q = 500 CFM/WHEEL, MINIMUM
NOT LESS THAN 250 CFM/PER SQ FT TOTAL OPEN AREA
DUCT VELOCITY = 4500 FPM MINIMUM
ENTRY LOSS = 1.78 SLOT VP + .25 VP FOR TAPERED CONVERSION
USE AMMETER TO GAGE WHEEL PRESSURES
ON SMALL 2 OR 3 SPINDLE MACHINES, ONE TAKE-OFF MAY BE USED
MULTIPLE TAKE-OFF DESIRABLE
PROVIDE AUTOMATIC SPRINKLERS OR OTHER FIRE PROTECTION
SEE FIRE AND INSURANCE CODES

Proper selection of fans through the use of curves or multi-range tables is an involved subject. The diligent engineer can obtain enough information from published tables to do the selecting himself or he can call upon the services of fan manufacturers' representatives who will give him assistance in selecting the proper fan. The usual fan selections for buffing and polishing systems are the radial blade or the backwardly inclined blade centrifugal fans. Of these the radial blade fan is the more popular and is of more rugged and durable construction. The vane axial fan is sometimes selected since it has the ability to develop the necessary high static pressure. Regardless of the type of fan used, it should be preceded by the dust collector.

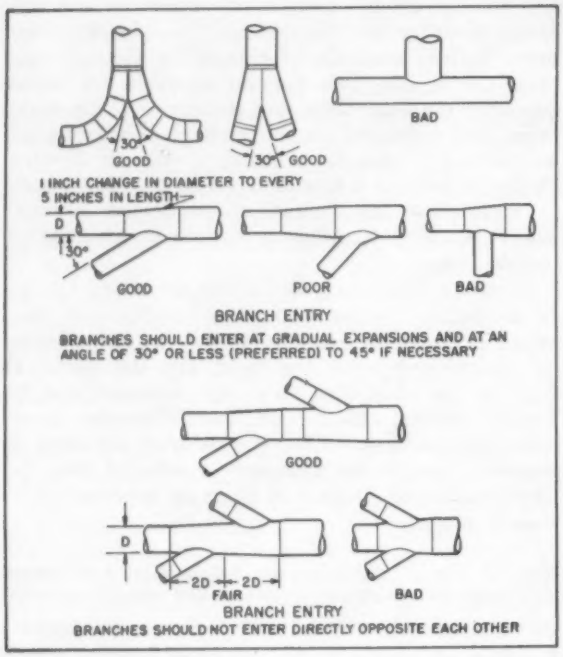


Fig. 13. Examples of good and bad duct and entry design.

In the installation of the fan, it is important that sufficient length of straight duct be installed both ahead and behind the fan to allow for straight air flow to the fan wheel. Wherever possible a minimum of 5 diameters of straight duct should be used on the inlet and while the same is desired on the outlet, an elbow discharge may be used if necessary. For centrifugal fans, the elbow discharge should be installed in the direction of rotation of the wheel, and not against the rotation.

Proper installation of the fan must be emphasized since bad inlet and outlet connections will reduce the capacity of the fan. Elbow inlets are to be avoided since the airstream turbulence and swirl caused by an elbow will result in uneven loading on the fan wheel, causing the fan to operate at some point off its predicted rating curves. Most fans are tested in the laboratory under conditions stipulated by the various codes of the Air Moving

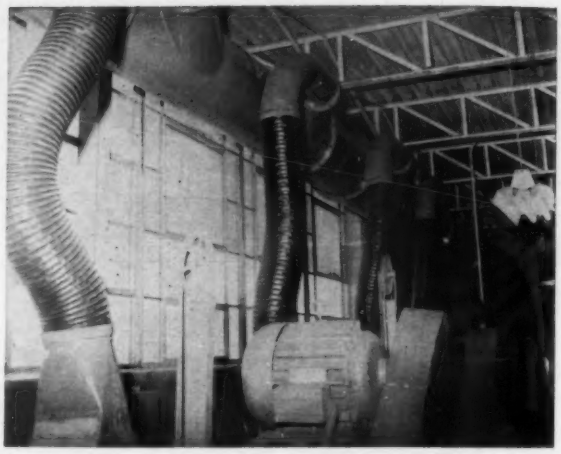


Fig. 14. This is an excellent example of good duct design.

and Conditioning Association, and it should be remembered that these codes are designed to test the fans with straight inlet and outlet flow.

Dust Collectors and Their Characteristics

In the case of polishing systems where no compound is used, any of several dust collectors may be used, ranging from the simple dynamic types which screen out the larger particles to the highly efficient bag filter or electrostatic precipitator. In the case of buffing where much compound and lint is encountered, the usual collector selection is limited to either the dry dynamic type or the various types of wet collectors.

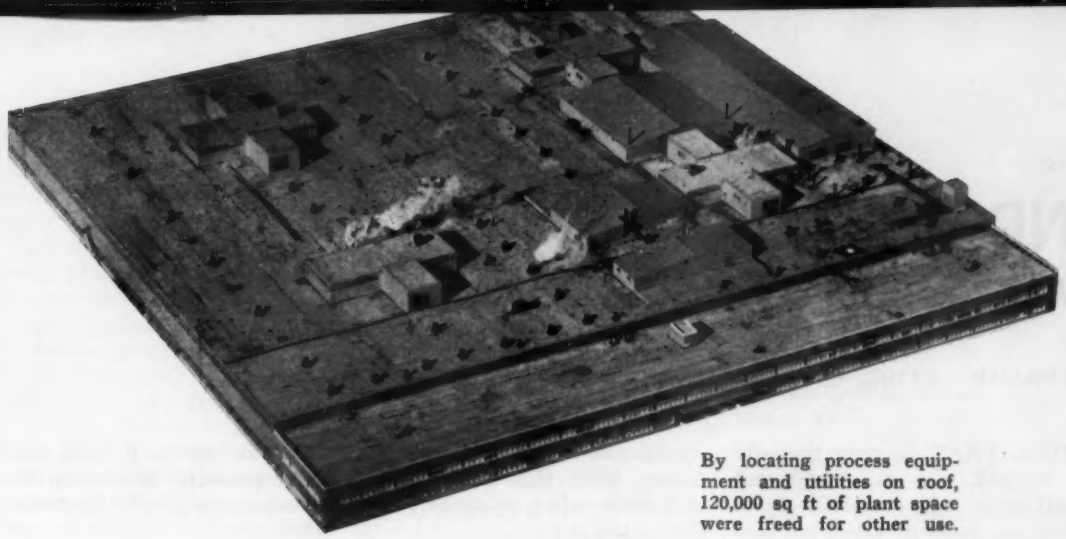
One difficulty which is encountered with wet collectors is that the buffing compound and lint tends to mat and collect on the surface of the water. Suitable ejection means or agitation must be used to provide proper dust collection. In the case of dry type collectors the most serious hazard encountered is that of fire, since the buffing compounds and lint may ignite from spontaneous combustion or sparks.

Many good references currently are available for the selection of collectors. Also, manufacturers will advise as to the proper selection, installation and maintenance of the units, as well as the operating static pressure drop of the collector.

Testing—Proof of the Pudding

All exhaust systems should be tested to determine that the design air volume is being exhausted and that transport velocity is maintained in all ducts. Failure to do this is a violation of good business practice and is analogous to buying a pig in a poke.

A satisfactory test can be made with the standard Pitot tube method and requires only 5—10 diameters of straight ductwork at some central point in the system. This may be provided at fan inlet where straight ductwork is most necessary. **End**



By locating process equipment and utilities on roof, 120,000 sq ft of plant space were freed for other use.

PUTTING A ROOF TO WORK

Ovens, Ventilators, Substations Move Up

By JOHN VONDERHEIDE, Manager, Plant Engineering, General Electric Co., Louisville, Ky.

THE NEWEST manufacturing building at General Electric Appliance Park, Louisville, Kentucky, was designed and constructed to use the roof area for building utilities stations, ventilation units, and process facilities.

Design, including the very extensive roof installations for the room air conditioner building benefited from experience with similar facilities problems in other Appliance Park manufacturing buildings and particularly experimental roof-located facilities in the home laundry department and a warehouse building. While no process facilities were included in these earlier ventures, they did prove that large flat roof areas could be profitably utilized.

This building, similar to other manufacturing plants at Appliance Park, is 600 ft wide and at present, the manufacturing portion is 520 ft in length. Designed specifically for the manufacture of room air conditioner products, it has a heavy requirement for fresh air make-up systems, more than 800,000 cfm. These were divided into units of approximately 100,000 cfm, and located in a room built above the roof line.

It was also our practice to use isolated substation locations for electrical distribution and these, too, were located in specially built rooms above the roof line, tieing in with the ventilation system locations. In addition, production required about 75,000 sq ft for paint system ovens. The decision was made to locate these in specially-built penthouses.

Here's Why

Advantages of putting the paint system ovens on the roof are:

The actual plant floor space could be reduced by the area gained with roof installations. Conveyor paths running underneath ovens could be routed through the building without restriction.

It would be easier to expand or rearrange the facilities with ovens on the roof because changes could be accomplished with minimum interference to production activities in the building below.

Heat generated by oven installations would be released outside the building, providing more comfortable working conditions in the finishing area. Paint systems are usually classified as "fire hazard areas" and danger is reduced by having the operations outside the main building.

Maintenance operations can be handled directly from the roof.

More positive ventilation can be provided and the problem of fume and haze dissemination into main plant areas is eliminated.

The roof location for ventilation systems and utility substations was attractive for many of the same reasons as those outlined in connection with the ovens.

Before adoption of the plan to use the roof area as described, our engineers had to evaluate carefully the gain of approximately 120,000 sq ft of space from either mezzanine structures or roof-hung platforms, against the cost of the housing rooms on the roof and the difficulties involved with building weatherproof oven structures.

There were numerous design problems involving building appearance, handling of maintenance materials and equipment,

(Continued on page 178)

INDUCED DRAFT FANS

What the Plant Engineer Should Know About Them

By WILLIAM J. MATIEZ, Application Engineer, L. J. Wing Mfg. Co., Linden, N. J.

FUEL THAT IS only partially burned, due to insufficient draft, is not only wasteful from an economic point of view, but also creates a dangerous condition by producing carbon monoxide.

When carbon monoxide is formed, heat output per pound of fuel carbon, is about 4000 Btu's. With complete combustion obtained with good draft, carbon dioxide is formed, producing about 14,000 Btu's per pound of carbon, an increase in efficiency of 250 per cent.

One way of creating a steady and dependable flow of combustion air whether at start-up, on a hot or cold day, with light or strong winds, is by using a motor-driven induced draft fan to suck air into the furnace and to pull combustion gases through the boiler. With this equipment, a stub stack only is required, rather than a tall one.

The draft inducer is a simple mechanism consisting of a motor-driven airfoil fan inside a metal housing that becomes part of the flue or stack. The fan rotates on air-cooled bearings. External cooling air is drawn over the bearings at all times and hot flue gases do not contact the bearings.

The entire rotating fan assembly can be moved out of the housing when necessary for inspection and maintenance, without disturbing the breeching.

Capacities. The draft inducers can accommodate both heating and power boilers. They are available for all heating boilers as small as 1000 sq ft EDR, and for high pressure boilers up to approximately 100,000 lb steam per hour.

Drives. Adjustable speed drives provide the most efficient operation, most convenient draft adjustment, and lowest electrical costs. V-belt drives eliminate possibility of misalignments due to expansion and contraction movements.

Variable speed motors or adjustable pitch sheaves permit running at high speeds for full load operation of the boiler and at lower speeds to maintain steam pressure at lower demands.

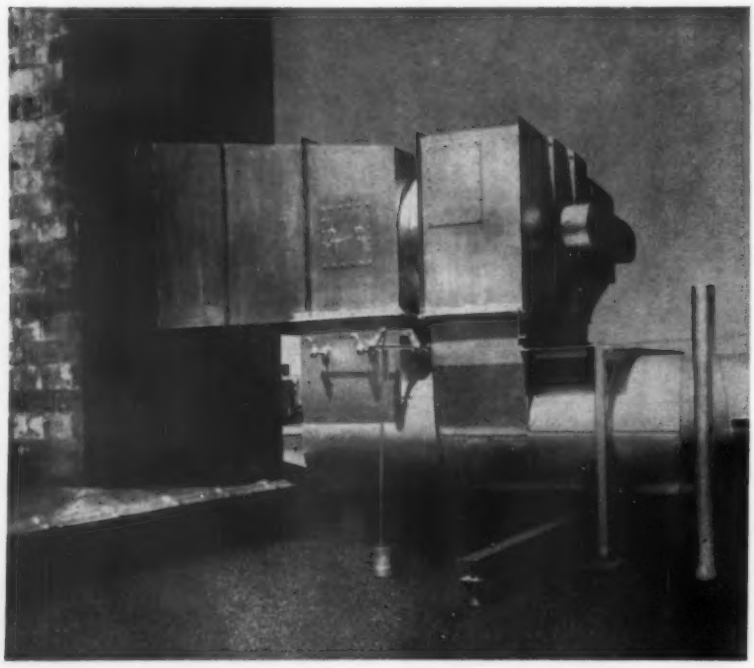
For larger or high-pressure boilers, direct drive by motor or steam turbine can also be furnished. A turbine is desirable when there is a requirement for low-pressure steam which would ordinarily be supplied through reducing valves from the high-pressure steam header. The turbine acts as the reducing valve eliminating the cost of electricity. A turbine will also prevent disruption of operation due to electrical power interruption.

In some installations a combination of turbine and electric motor is most advantageous.

In many installations it is possible to obtain sufficient natural draft from the stack effect alone, on light loads when the furnace has been operating, without using the fan. In some installations a by-pass duct around the inducer can be provided for extra natural draft at light load.

Mounting. Although draft inducers are usually located as an elbow in the breeching between the boiler and the stack, they can be mounted elsewhere. When space is restricted in the boiler room, inducers can be mounted on

Fig. 1. When stack is separated from boiler room, fan is installed in breeching.



top of the stack or on the boiler itself.

In cases when the stack is separated from the boiler room, the inducer may be installed out of doors in the breeching, Fig. 1.

Many inducers are installed in existing plants to replace stacks that have corroded or have been damaged. This situation often presents severe space problems. Existing girders, pipes and walls may interfere with the placement of the inducer. However, many ingenious designs have been worked out for fitting draft inducers into limited spaces.

Because of their relatively light weight, inducers can be supported in several ways. Most are hung from the ceiling or roof. In other cases they are supported from the floor on light platforms. Wall mounting on brackets is another popular method. The driving motor can be mounted in a vertical position on the underside or on top of the housing. Usually the motor is mounted in a horizontal position.

How Many Inducers. Generally, one inducer is installed to serve its own boiler. But there are many installations in which one inducer is employed to serve two or more boilers, especially where the stack may be adequate for light loads. When all boilers are operating, the inducer runs at full speed. At less than full load, the inducer may be operated at reduced speed or the draft may be regulated by a damper.

For multi-boiler installations, an inducer for each boiler is usually most advantageous from the standpoint of increased protection against draft interruption.

Selection. For many heating boiler applications the correct inducer can be selected quickly and without difficult computations directly from tables. Selection curves are also available for higher pressure boilers and for when the breeching or chimneys are smaller than the boiler smoke outlets.

Costs. Many studies have shown that the capital cost of a tall stack is 30-50 per cent more than a draft inducer and stub stack. Operating costs with an inducer should be less because of more efficient combustion. **End**

TIPS ON CHOOSING ROTARY FEEDERS

By JOHN FISCHER, Chief Engineer, Materials Handling Div.
Sprout, Waldron & Company, Inc., Muncy, Pa.

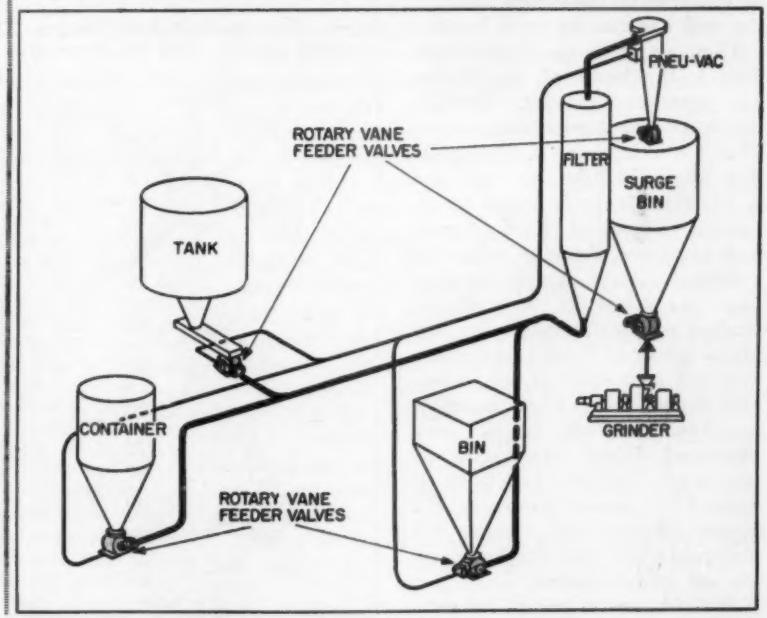
PRESENT TRENDS toward continuous processing and automatic machinery would come to a grinding halt if design engineers weren't on top of the problem of accurate and reliable feeding mechanisms. This is particularly true in the field of solids handling, because variations in particle size, in density, in shape and in flow characteristics of the material pose quite a problem.

Where volumetric control is important, and particularly where the feeder must serve as an airlock in a pneumatic system, the rotary feeder is industry's first choice. Basically, it consists of a number of pockets formed by the series of vanes mounted on a shaft. As the shaft revolves, the pockets pick up and discharge the material at rates which are determined by the speed of rotation. The quantity is also determined by the cubic capacity of the individual pockets.

By maintaining close tolerances between the rotor blades and the housing, rotary feeders serve as airlocks and eliminate air leakage at the discharge end of pneumatic equipment and can be used as a seal between the mechanical feeder and a pneumatic conveying line.

This simple description belittles the precision workmanship, quality materials and design ingenuity which are required. It's almost

Fig. 1. Rotary feeder valves are used in a variety of applications as: From left to right, volumetric feeder; seal between mechanical feeder and air line; volumetric feeder and sealer for discharging storage bins; valve and explosion check.



like defining an automobile as a motor-powered, four-wheel means of conveyance. Such a definition makes no allowance for the big gap between the Model T and the Rolls Royce. The only true way to evaluate a rotary feeder is in terms of the job it has to do.

Price buyers often find that they have cut the efficiency of an expensive system by saving a few dollars on the purchase of a "cheap" feeder or by buying a standard feeder, even a good one, out of the catalog instead of having one engineered for their own needs.

Let's look at the characteristics that make for a quality rotary feeder and examine some which have been especially engineered for tough applications.

To begin with, it is important that one consider the function of the feeder. Is it to be used as a volumetric feeder? as a rotary airlock? as an explosion check? Many construction and design details are tied directly to these functions and for the best recommendations, the manufacturer should know what you plan.

Another primary concern is the nature of the material being handled. Standard cast iron construction may not be suitable. You may want to specify stainless steel, brass or bronze, monel or other special corrosion resistant material. Here too, the manufacturer's recommendations based on the end use can be very helpful.

Then we come to rotor design. This is the heart of the feeder. For maximum capacity there is the deep pocket with solid vanes. This is also made in a similar design which has flexible tips, and is therefore recommended where foreign, oversized hard objects and excessive abrasion might be expected. These tips can be supplied in a variety of materials, including rubber, Teflon, nylon, etc. Many rotors of Type I have been specified with stellited tips to provide longer wear when handling abrasive materials but if hard oversized objects are to be encountered, Stellited tips offer no protection against jamming. For lower capacity and cleaner discharge, designs with shallow pockets are recommended.

Maintenance is one of the most important considerations in purchasing any type of equipment today. To begin with, the quality of the machinery often determines to a great extent the size of the maintenance budget. The least expensive rotary feeder may be the one which costs the most to buy.

Quality features to check for include:

1. Close tolerances between rotor and body.
2. Precision machining.
3. Use of outboard bearings.
4. Adequate packing.
5. Ease of inspection and maintenance.
6. Use of packing glands.

As mentioned previously, the intended application of the unit is of major importance in deciding which feeder will do your job best. For simple volumetric feeder duty under atmospheric pressure selction is only a matter of determining the proper valve size and operating speed needed to deliver the desired feed rate.

Selection can become very complicated, however, if the material being handled is very light and fluffy, and very fine. In these cases, actual capacity of a given value may vary substantially from the theoretical value. On free-flowing, average weight material there is a straight line relationship between actual and theoretical capacity up to approximately 60 rpm. This does not hold true for light materials.

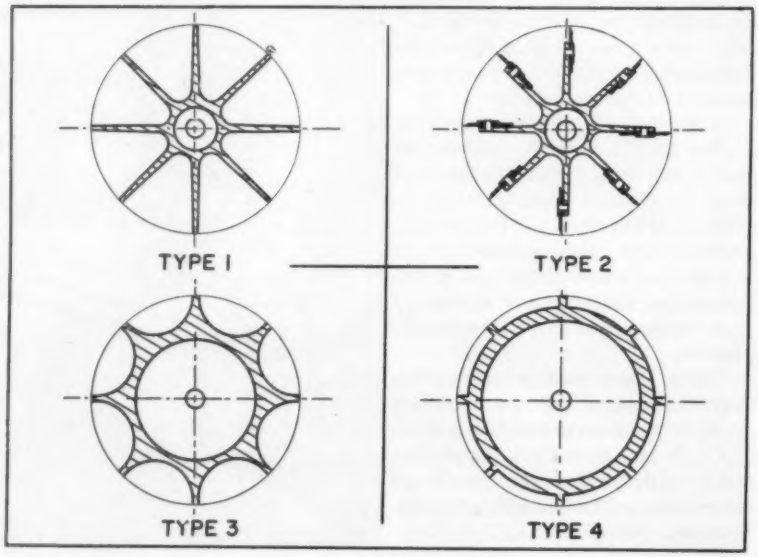
Simple feeder applications do not require very close operating clearances between the rotor and the casing but when the application definitely requires an airlock, machined clearances of 0.002 to 0.004 in. are necessary.

In selecting a feeder which must serve as an airlock it should be sized so as to be capable of carrying at least twice its theoretical rate. This allows the valve to serve its purpose of maintaining an air seal without restricting the discharge of the material.

An extremely complex selection procedure is required when the rotary vane feeder serves the combined purpose of an airlock feeding a positive pressure air line, particularly if there is a full head of material over the valve. The recommendations of a specialist at the beginning will save many headaches during operations. Our company's standard rotary valves provide an effective seal against pressure differentials up to 15 psi. It should be remembered that there will always be some leakage, the amount depending upon the size of the airlock, the rotor clearance and the pressure differential across the unit.

The important thing to bear in mind is that the rotary feeder should be carefully selected in view of the job to be done. **End**

Fig. 2. Four standard rotor designs. Type 2 has flexible tips for use where excessive abrasion may be encountered. Other types can have Stellited tips.



CONSTRUCTION AND MAINTENANCE

Who Contracts It Out—And Why

Who makes the decision to contract-out this work? Does the size of the job affect the decision? Or geographical location? Or plant size? Factors involved in the decision were the subject of a study made by the authors, based on a proportionately stratified random sample of 74 companies, normally employing 1000 or more people and representing 16 industrial groups

By MARGARET K. CHANDLER, Assoc. Professor, University of Illinois, Inst. of Labor and Industrial Relations and LEONARD R. SAYLES, Assoc. Professor, Columbia University, Graduate School of Business[1]

WHAT IS YOUR general policy on contracting maintenance and construction work? The plant engineer at Company A replied, "We contract-out as much as we can. Contractors are competitive. They don't have such large overheads." However, the head of industrial relations in the same firm commented, "We try to give our people the work. We farm out as little as possible."

Is this an isolated case of befuddled management? No, this case is typical of the controversy that characterizes this area of management decision-making. Differences of fact and opinion are found not only among industries and firms where one might expect them, but also within a single establishment, among members of the same management group. Plant engineers are concerned directly with these problems, for they are central figures in the contracting decision.

To what extent do industrial firms depend on outside sources for maintenance and construction work?

Table I gives a picture of the current state of affairs with respect to the proportion of maintenance and construction work contracted-out. The larger the job, the greater the tendency to turn it over to an outsider. In the maintenance field, slightly less than four out of 10 in the sample contract-out more than 25 per cent of non-routine maintenance.

As expected, routine maintenance is largely an in-plant operation, although more than one-third do some maintenance contracting. In some companies there appeared to be a trend toward contracting the less skilled types of routine maintenance.

Our study attempted to distinguish the treatment accorded five major crafts which are apt to be affected by contracting-out practices. Table II summarizes the amount of such craft work presently contracted-out.

Respondents indicated that this picture was relatively stable. Inspection of Tables III and IV reveals that more than two-thirds of the firms reported that there had been no significant change in the amount of work contracted during the last five years. Of those reporting change for the various types of projects (see Table III), a majority observed that it was in the direction of some decrease in the amount of work contracted-out. Major construction work was the sole exception to this trend.

Efforts to discover whether specific crafts differed with respect to the changes are summarized in Table IV.

From the 74-plant master sample, groups of "high

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About the Authors

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contractors" and "low contractors" were selected on the basis of the amount that these firms annually contracted-out. Thirteen firms fell in the first category and 19 in the second.

Attempts to relate membership in these two groups to industry type revealed no consistent pattern, with the exception of apparel firms which were high contractors.

In relating the amount contracted to the size of plant, one would expect larger firms to undertake more of their own work than smaller ones. This tended to be the case, although there was no strong relationship. Seven of the 19 low contractors were plants employing 5000 or more, while only two of the 13 high contractors fell in this group.

Table I. Percentage of companies contracting-out specific proportion of construction and maintenance work.

Type of Project	Portion of Work Contracted-Out						
	None	Below 25	26-75	Above 76	All	Don't Know or No Answer	Total
Major Construction	3	5	5	4	80	3	100
Minor Construction	15	35	28	14	5	3	100
Modernization	9	34	22	14	14	7	100
Non-Routine Maintenance	15	46	31	3	4	1	100
Routine Maintenance	62	28	5	1	1	3	100

Table II. Percentage of companies contracting out specific proportion of craft work, such as electrical, masonry.

Craft	Portion of Work Contracted-Out						
	None	Below 25	26-75	Above 76	All	Don't Know or No Answer	Total
Electrical	31	41	20	4	3	1	100
Plumbing	30	36	24	1	8	1	100
Masonry	23	27	22	5	20	3	100
Sheet Metal	26	26	22	5	18	3	100
Iron Work	26	22	22	5	22	3	100

Further contrasting high and low contractors, one would expect high contractors to have a smaller proportion of the total plant work force devoted to maintenance and construction activity. This was true. For 12 of the 13 high contractors, maintenance and construction forces constituted less than 10 per cent of the work force. The low contractors were divided more evenly, with eight of the 19 reporting under 10 per cent and 11 over 10 per cent. Of the latter group, four firms had more than one-fifth of the total force in maintenance and construction work.

Table V summarizes the survey information relating to the contribution of various levels in the management hierarchy to decisions concerning maintenance and construction work.

As we might expect, major projects, that is, those involving relatively large expenditures, are handled differently from minor projects, although the differences are primarily in terms of who plays the active role in the decision process. In minor projects, plant engineering executives are only half as frequently utilized in an advisory capacity.

As can be noted, in most companies general management plays a determining role in contracting-out questions that involve major projects. The plant engineering function is the next most significant group in terms of active decision making on major projects, with lower level management, such as the head of the maintenance function, playing a relatively minor role. In fact, in about two-fifths of the firms, lower level management has no role in the decision at all. Instances where the plant engineering groups are key figures in major decisions were found in the following industries: textiles, printing, chemicals, oil, transportation equipment and scientific instruments.

For minor projects, lower level operating managers have an active role, but in this case plant engineering management is almost as important. In about one-third of the companies, plant engineering personnel is not involved at all, in either major or minor decisions. This figure seems larger than one would have anticipated. How does this situation arise? In some cases the plant engineer, as a newcomer to the management group, finds himself bypassed because old communications channels persist.

While the data indicate that the importance of the decision and the organizational level of the decision maker tend to coincide, notable exceptions to this rule were uncovered. For instance, there were cases of top level management handling all matters from major construction to routine maintenance. In other firms, both top and lower level management independently took initiative in decisions regarding such minor matters as painting smokestacks or sweeping floors.

It also should be noted that in almost three-quarters of the companies surveyed, executives reported that local personnel had rather complete independence from headquarters in deciding minor maintenance and construction matters. When headquarters participated, it was only to provide routine, almost automatic, approval for decisions reached down the line. Headquarters staff became involved in major decisions in two out of three of the cases, but even so, there appears to be a substantial amount of decentralization with regard to these decisions—a decentralization that may reflect the inherently "local" nature of problems in this area.

In about one-fifth of the cases, contracting was considered a major problem and specific channels were established for handling every decision that had to be made. In these cases, the decision tends to move quickly up the management hierarchy, although subsequent events may cause this process to be reversed. Moreover, industrial relations personnel are apt to become involved.

In general, the data indicate that industrial relations departments rarely play an important role in providing advice in these matters, but in two companies, which are the exceptions, industrial relations people have a direct part in the decision-making process.

In firms where contracting-out has become an active bargaining issue, relationships with the union are handled by operating management in about 15 per cent of the cases and industrial relations and plant engineering divide the remainder.

To what extent do management decision-makers agree on matters relating to the contracting-out of work? In a subsample of 17 firms, plant engineers and

fellow members of management were compared with regard to position on matters of policy and costs. In six of the 17 cases the engineer disagreed with other members of management regarding company policy and in eight of the 17 cases there was disagreement on the question of the relative cost of contracting-out and using in-plant work forces. Disagreements apparently reflect the fact that in some cases unilateral company policy and practice are more myth than reality.

Which is cheaper, contracting-out or doing it yourself? Responses to this question are summarized in Tables VI and VII. On the basis of Table VI, it might first appear that relative costs are a crucial determinant of the amount of work contracted-out since these figures seem to have a relationship to the data on the amount actually contracted.

For instance, in the case of major construction, a type of work largely contracted, a majority of the firms believed that contracting is less costly than doing a job yourself. On the other hand, for routine maintenance, which is contracted rather infrequently, a majority felt that contracting was more costly.

Even here, there is a significant dissenting group—about 30 per cent indicated that major construction work was more costly when done with outside contractors, and 15 per cent felt that routine maintenance could be handled less expensively by them.

For the other categories, minor construction, modernization and non-routine maintenance, opinion regarding relative cost tends to be rather evenly divided. On the average about 30 per cent of the firms believe that for these three types of work outside contractors are more expensive and almost the same proportion believe they are less expensive.

Responses to the question of relative costs also revealed a diversity of opinion regarding the various craft groups. According to the data in Table VII, there is a tendency to rate the contracting of electrical and plumbing work as more costly than the "farming-out" of masonry, sheet metal and iron work.

Responses to an over-all question as to whether contracting-out was generally cheaper or more costly than "doing-it-yourself" mirrored the patterns of detailed response in Tables VI and VII. Forty-one per cent considered contracting cheaper and the same percentage disagreed. Twelve per cent felt that costs of the two alternatives were about the same, and six per cent either did not know or did not answer. The food industry was the only one with a universal tendency to consider contracting-out more costly.

Has contracting out become relatively more or less expensive than doing work yourself? In answer to this question, about 30 per cent stated that contracting-out costs had gained relative to internal expenses while almost 20 per cent felt that internal expenses had risen more rapidly. Nearly 45 per cent believed that the two sets of figures had kept pace with one another. Reports regarding relative changes in the cost picture did not appear to follow industry lines.

Were all of these conclusions based on rigorous calculations or might differences in the calculation process be related to differences in conclusions regarding relative costs? Members of management were asked to describe their methods of cost computation. Responses revealed that complex cost calculations were not employed universally but rather were limited to about three-fifths of the group. Of the remaining 40 per cent, about 30 per cent made rough computations, and slightly over 10 per cent of the group made absolutely no cost calculations.

Interestingly, the character of the computing system had no relationship to the conclusions regarding relative cost. Thus those who did not consider cost, "rough calculators," and "complex calculators" were almost equally divided on the question of whether contracting-out was more or less costly than "doing-it-yourself."

In discussing costs, management interviewees often alluded to the size of the internal overhead charge. Evidently its magnitude can become a touchy subject for debate in management circles, and those who feel that a relative cost determination is not consistent with their interests dispute the methods used.

For instance, in some cases plant departments felt that "high" overhead assessments hampered their ability

Table III. Percentage of companies reporting changes in amount of work contracted-out during past five years.

Type of Project	Percentage of Firms Reporting Change in Direction of:				
	Increase	Decrease	Same	No Answer or Don't Know	Total
Major Construction	7	3	74	16	100
Minor Construction	5	7	70	18	100
Modernization	5	10	69	16	100
Non-Routine Maintenance	3	10	68	19	100
Routine Maintenance	4	10	70	16	100

Table IV. Percentage of companies reporting changes in amount of craft work contracted-out during past five years.

Craft	Percentage of Firms Reporting Change in Direction of:				
	Increase	Decrease	Same	No Answer or Don't Know	Total
Electrical	5	9	71	15	100
Plumbing	4	11	70	15	100
Masonry	4	7	71	18	100
Sheet Metal	4	5	75	16	100
Iron Work	4	5	75	16	100

Table V. Percentage of companies in which various management groups have a given role in contracting-out decision.

Contribution to Final Decision	Management Group							
	General Management		Supervisory Staff		Plant Engineering Staff		Industrial Relations Staff	
	Project Major	Project Minor	Project Major	Project Minor	Project Major	Project Minor	Project Major	Project Minor
Active Role	75	23	12	53	27	47	4	2
Advisory Role	1	7	46	31	42	23	15	12
Routine Approval	16	28	3	1	0	0	0	1
No Role	8	42	39	15	31	30	81	83
Total Percentage	100	100	100	100	100	100	100	100

to compete for work. Data on overhead charges were obtained in a subsample of 48 firms. Of these, three-fifths added a moderate 15-50 per cent charge to their labor and materials costs. One-fifth exceeded this level and a similar proportion charged little or no overhead. In one case where no overhead was charged, the plant engineer remarked:

"I don't take overhead into account—just what we would have to pay out in direct labor and materials. The overhead is there anyhow."

However, calculations made without any charge for internal overhead did not deter him from contracting-out a fair amount of work.

Do firms that charge low overhead tend to conclude that contracting-out is more costly than in-plant operations while high overhead chargers reach the reverse conclusion? Evidently the size of the overhead charge is not a critical factor, for no such relationships were found. In general, while there was diversity in approach to the cost calculations, this diversity did not seem to point to any specific effects on conclusions regarding cost.

Table VI. Company estimates of comparative cost of contracting-out and employing in-plant forces (by project).

Type of Project	Percentage of Firms Reporting Contracting-Out				
	More Costly	Same	Less Costly	No Answer or Don't Know	Total
Major Construction	27	8	45	20	100
Minor Construction	29	19	28	24	100
Modernization	31	11	38	20	100
Non-Routine Maintenance	38	14	26	22	100
Routine Maintenance	49	12	15	24	100

Table VII. Company estimates of comparative cost of contracting-out and employing in-plant forces (by craft).

Craft	Percentage of Firms Reporting Contracting-Out				
	More Costly	Same	Less Costly	No Answer or Don't Know	Total
Electrical	44	15	19	22	100
Plumbing	42	15	19	24	100
Masonry	34	9	31	26	100
Sheet Metal	34	11	31	24	100
Iron Work	31	7	38	24	100

Size of plant seemed to have some relationship to estimates of the relative cost of contracting-out versus in-plant operations. Of the plants employing more than 3000, a significant majority (70 per cent) considered contracting-out cheaper than in-plant work. In those with fewer than 3000 employees, there was an almost equal division on the cost question.

Of all the variables considered, geographical differences seemed to have the closest relationship to position on the relative cost question.[2] In two of the metropolitan areas, Chicago and Philadelphia, the prevailing view was clearly that contracting-out was cheaper than in-plant work while in Boston and New York the reverse position was held. Detroit, Cleveland, and Pittsburgh presented a less consistent stand on the issue. In the New York situation, position on relative costs is reflected in behavior, for that city had the largest concentration of firms with a low level of contracting and none with a high level.

What can be concluded about the relative importance of the cost factor in this decision? Although one might anticipate in advance that cost is the crucial determinant of the decision to contract-out or employ in-plant forces, many informants regarded cost as an 'iffy" area, yielding its key position to other considerations.

When asked whether contracting-out would have to be cheaper before a decision to contract-out could be made, only 12 per cent of the firms answered in the affirmative. The following quotations give some of the reasons for this response:

"Cost is not the main consideration. This maintenance and construction work is a stop and go affair—a peak and valley problem. Contracting will help us over the peaks. We can't hire and fire to keep up with the demands of the work load."

"If we are not equipped to do a certain kind of work, cost is not a consideration. Of course the union may disagree with us on that. Where we are equipped to do the job and we have people who have done it, then we have them do it again. We wouldn't even ask if it were cheaper to go outside —unless it was significantly cheaper. I am proud to say that we haven't fallen into the trap of trying to do things we know we couldn't do as cheaply as an outside company."

Interviewees also revealed that management decision-makers take into account a number of cost-related factors, such as speed and efficiency that are difficult to evaluate numerically. The manager of construction in one firm described his dilemma:

"We make up some gunshot figures, but there are these intangibles that are hard to evaluate. With the contractor you have to think of his profit and of course his overhead, that is loaded with all kinds of things. For us there are considerations of operating stability and efficiency that make it hard to compare the two."

In conclusion, it can be noted that our evaluation of cost or any other factor that may influence this decision can point only to general patterns and trends. The realities of the immediate situation are often the significant determinants of action. One informant expressed this point of view succinctly:

"We have the philosophy that we will do the job with our own people if we have 1. sufficient manpower, 2. sufficient skills, 3. the necessary equipment, and 4. and this is the most important—if the job can be done within the required time limits. But, in most of these decisions, after we get all this worked out in fancy detail, we say we 'fly by the seat of our pants.'" **End**

[2]This picture is consistent with our view that in this decision, inter-firm differences are more significant than inter-industry differences.

Eleven plant engineers met on December 17th to discuss the formation of a Plant Engineers Society in the Syracuse area.

PLANT ENGINEERS ORGANIZE IN SYRACUSE

ON DECEMBER 17th, 11 plant engineers from the Syracuse area attended a meeting at the Yates Hotel to discuss the formation of a Plant Engineers Society. Election of officers was also on the agenda as well as obtaining more information on membership requirements of the national organization—American Institute of Plant Engineers.

Also in attendance was Rocky Marinello, of PLANT ENGINEERING magazine, who discussed how the plant engineers societies got started and the advantages that can be derived from such association. He also answered questions concerning chapter affiliation with the AIPE as well as individual membership.

Those attending and appearing in the photograph, seated left to right, are: D. Pomfrey, Continental Can Co.; E. Whorrall, New Process Gear Corp.; J. Carl, Crouse-Hinds Co.; Rocky Marinello, PLANT ENGINEERING magazine; and J. Loveless, Crouse-Hinds Co.

Standing, left to right, are: P. Lehon, Crouse-Hinds Co.; J. L. Webb, Crucible Steel Co.; A. Kurtz, New Process Gear Corp.; F. Wohlfarth and W. Dean, both of Electric Auto-Lite Co.; M. Davis, Smith-Corona, Inc.; and C. Losky, Easy Washing Machine Corp.

Officers nominated and elected at this meeting were: John Carl, president; Don Pomfrey, vice president; Bruce Brennan, secretary; and Fred Wohlfarth, treasurer.

They are planning to join the national organization in the near future and will discuss this subject further at their next meeting. **End**

Officers nominated and elected at this meeting were, left to right: John Carl, president; Don Pomfrey, vice president; and Fred Wohlfarth, treasurer. Bruce Brennan, of Lamson Corporation (not in the picture) was elected secretary.

Fig. 1. Overhead drill press drills many holes without work having to be moved, as on this lathe table. It can also be used for large panels and assemblies. Mounted on A frame, the drill press can be moved to any department in the plant.

HOW TO DESCRIBE DRILL PRESSES

By JOHN H. DIEHL, General Manager, Bellefontaine Div., Rockwell Mfg. Co.

WHAT MACHINE TOOL can be made portable, automatic and combined with other tools to perform several operations simultaneously? The answer is the simple drill press.

The drill press is easily installed in any position—vertical, horizontal and at other angles—without complex supports or loss of stability. Because feed is simple, it is easily set up for electric or pneumatic control.

Versatility of the drill press is due to the variety of tooling that may be used with it. In addition to drilling, reaming, tapping, spotfacing, and all other standard drill press operations, tools may be used for grinding, polishing, milling, routing, and other operations conventionally performed on special purpose tools.

The simplest setup we have for employing drill press versatility is a ten-spindle, one-table machine on which we drill several hundred different parts that are produced in quantities too small to justify a permanent drill press setup. It is a special setup made from standard drill press heads and multiple-spindle drill press table sections.

Two or three operators will work at this tool, passing the work from one spindle to the next. The work may be one ten-step job or two or three jobs requiring fewer operations. We have made the work partially automatic by installing automatic feed devices on four of the spindles, two at each end. An operator working from the end may start the first step and go on to the second and third before the first is completed. Power feed devices are installed only on four spindles in order to maintain maximum flexibility.

Many unrelated operations may sometimes be combined as in our setup for machining saw tables. While a slot is milled in the surface of a table on an automatic milling machine, the operator drills and taps four holes in a piece that has already been milled.

The four drill presses are mounted in pairs, two on floor-model columns joined by a workholding fixture that permits vertical mounting of the work, and two on a standard two-spindle drill press table. This table is mounted on retractable casters so that it may be rolled to the most convenient position.

After placing one piece in the milling machine and starting it, the operator places another, already milled, in a jig and mounts it under the first two drill press heads. The jig slides in the workholding fixture. The operator slides the jig into indexed position under one spindle for drilling, and under the other, which holds a tapping attachment, for tapping two holes on the side of the piece. He then drills and taps holes on the surface of the piece in the other setup. By adding the drill presses to the setup, nine operations are performed instead of one.

Often an automatic feed device on a drill press will

Fig. 2. Tables are drilled with horizontal press, set on wheels. Vertical unit, (not shown) drills mounting holes.

Fig. 3. Drill presses mounted face to face route lubricant grooves. The sliding jig provides V movement to the work.

IN ONE WORD—VERSATILE

combine operations without a special setup by freeing the operator to perform a secondary operation. For example, in one operation in our plant the operator actuates a drill press with automatic feed and then reams the hole in a previously drilled piece with a portable electric reamer. Two operations are performed in the time ordinarily required for one.

Portability of power tools also adds greatly to their versatility. A number of our tools are mounted on casters so that they may be readily moved into place as needed. For example, in an operation for joining work table sections and drilling mounting holes in them two portable drill presses are used

With portable drill presses, it is possible to do all jobs with the same setup. The drill press which drills dowel holes in table edges is mounted horizontally on a platform with casters. When used, it is rolled up to a conveyor table which holds the sections to be drilled and is connected to the table by a pair of brackets between the drill press and the work. The brackets and the weight of the platform keep the drill press steady during drilling.

The tool used for drilling mounting holes is also mounted on casters. Its column is offset so that it will reach over the work and its table is positioned under the conveyor table to provide adequate support during drilling. The platform is weighted to counter-balance the weight of drill press when extended over the work.

An overhead drill press which we use for several operations illustrates the advantages of a setup that has "built-in portability." The drill press which is a standard product except for the actual track on which it runs, can be moved to any point within 10 in. of either side of the track. We use it for drilling lathe beds, saw tables, and other large surfaces.

Since these jobs are done in different departments, we have made the overhead drill press itself portable by bolting its track on a pair of A frames 12 ft apart. Moving it from one department to the next as production requirements change is considerably easier than moving the work.

A setup for milling lubricant grooves in a work table is typical of the many non-drilling jobs that are assigned to drill presses.

Two drill presses, fitted with grooving tools, are mounted face to face on a drill press table so that the distance between spindles is equal to distance between lubricant grooves. A two-piece sliding jig over which the work is positioned is made to provide the V movement as the work is passed through the machine. The bottom part of the jig, bolted to the work table, has two guide cams in its center. The top part which fits over the bottom is grooved to ride the cams in the same pattern desired for the grooves in the work. **End**

TANK GETS NEW FACE—INSIDE
Plastic Lining Repairs Old Water Tank

A PLASTIC COATING applied inside a water storage tank owned by Lansing, Mich., saved that city a $125,000 bill for replacement of the tank. Instead, the city paid a total of $5500 to a plastics compounding firm and a contractor for a job that took four workers a week to complete.

The 55,000-gal tank is used as a reservoir for the water softener system for water used in city boiler installations. It was erected in 1923 and was constructed of ¼-in. steel plate. Despite the fact that the inside of the tank was coated almost yearly with an asphaltic type material, corrosive action reduced the steel thickness by approximately one half.

In addition, there were 600 to 700 holes at the waterline, a six-foot section on the inside of the tank where the water level fluctuates. Some of the holes were large enough to permit a finger to be placed through them.

This left the city engineer with the alternatives of either replacing the entire tank at a cost of $125,000 or finding some means of maintenance by which the tank could be preserved. He was referred to Ren Plastics, Inc., a Lansing company which specializes in the production of epoxy resin compounds. It was recommended that a plastic material be laminated on the inside of the tank to fill the holes and preserve the entire tank for continued use.

The first step was to sandblast the entire interior to clean off tarry substances which had been placed on the inside of the tank on previous unsuccessful repair jobs. This left a "rough finish" upon which the plastic material could be laminated.

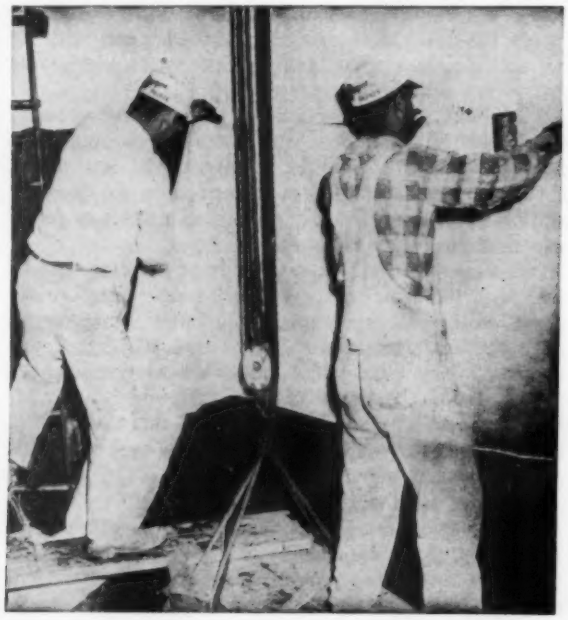
The process consisted of first rolling on a coat of resilient plastic material followed by placing fiber glass cloth over the plastic. Then came a layer of non-resilient plastic material and another layer of glass cloth, followed by layers of non-resilient plastic and resilient plastic material.

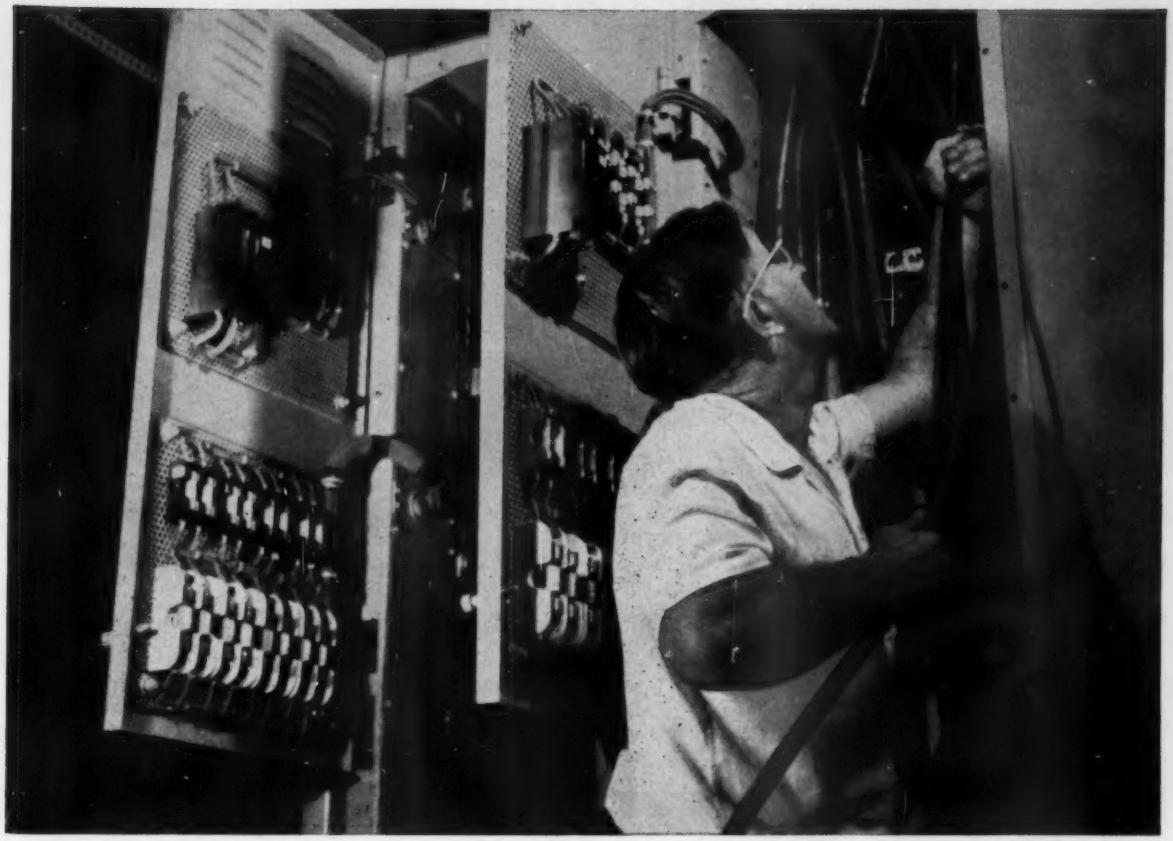
At the water-level area, two additional layers of glass cloth and layers of the non-resilient plastic were applied for more strength. In each application the glass cloth used was 44 in. wide and .013 in. thick.

Applications of plastic material and glass cloth actually produced a plastic tank within a steel tank. The plastic coating does not require the annual maintenance and patching previously necessary. The coating is guaranteed to remain operational without major attention for five years. However, it is anticipated that 20 years is a more likely estimate of the life of the plastic coating. **End**

Fig. 1. Resilient plastic material is applied to inside wall.

Fig. 2. Next layer is glass cloth, then process is repeated.





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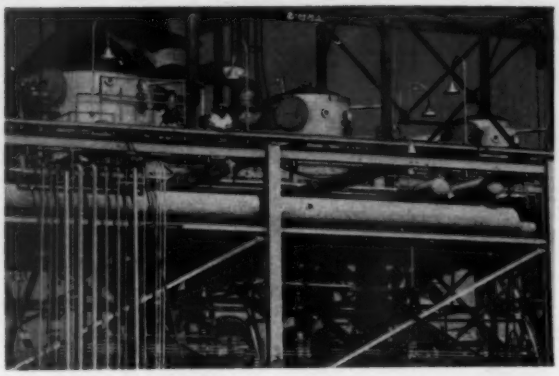
New Chemical Plant Puts Research, Money into Sewage Problems

FIVE YEARS IN DEVELOPMENT, the pollution control system at American Cyanamid's new Santa Rosa, Fla. plant cost over one million dollars. Among the plant's control facilities is an 11 million-gallon settling basin, where sludge and other waste solids are separated from liquid wastes. An asphalt lining prevents seepage from the basin.

An underground pipeline carries wastes from the plant to the settling basin; from there, a 5000-ft line carries the liquids to a point offshore (in Escambia Bay).

Since most materials brought into the plant will be used in the production of the company's acrylic fiber, Creaslan, or recovered for re-use, the amount of waste from the plant will be limited. Those wastes that must be discharged from the plant will be neutralized, aerated, equalized, settled, skimmed and lagooned. The sludge will be retained permanently in the settling basin.

The offshore discharge point will be about one mile out in the Bay, where the liquid wastes will be quickly dispersed. Tests conducted by Cyanamid have shown that there will be no odor or discolorization of the water.



New Bulk Terminal Serves Gulf Coast Industrial Markets

COMPLETION of the $15,000,000 Burnside Bulk Marine Terminal, a new facility of the Port of Baton Rouge, opens the largest facility for handling bulk cargo in the Gulf Coast area. An adjacent alumina plant, built and operated by the Ormet Corporation, adds $55,000,000 to the investment made in the Burnside site within the last 30 months.

Equipped with two gantry crane unloaders, each with a lifting capacity of 12 tons and a free digging capacity of 1200 tons per hour, the maximum material handling capability of the site is 4800 tons per hour.

With an integrated system of cranes, loaders, conveyors and ground storage areas, the facility will be used to unload bulk material from ships and transfer it to barges for transshipment upriver; unload ships to ground storage area; unload barges and load into ships; unload barges to ground storage; load ships or barges with bulk material from ground storage areas.

The alumina plant will produce 345,000 tons of alumina yearly, for transport to Hannibal, Ohio, where it will be reduced to aluminum in a plant recently completed by Ormet. Seven hundred thousand tons of bauxite, shipped from South America, will be unloaded at the site, as the plant's raw material.

The Ormet Corporation is a joint venture of the Olin Mathieson Chemical Corp. and Revere Copper and Brass Incorporated.

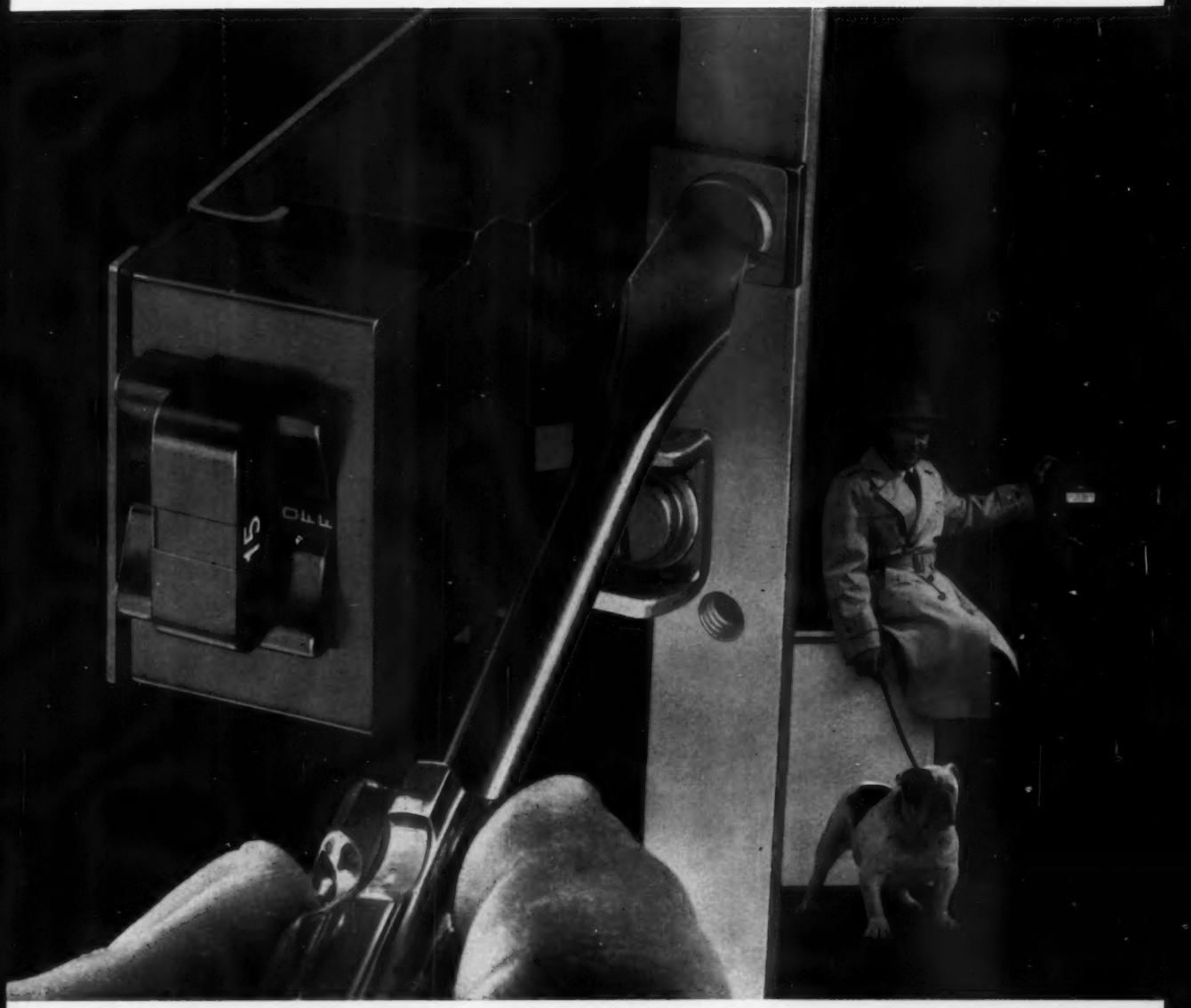
Welding Positioner Handles Six-Ton Transformer Tanks

DEVELOPED BY General Electric's Medium Transformer department, an oversize welding positioner flips transformer tanks, weighing up to 12,000 lb, into various positions for ease of welding.

Motor-driven, the positioner enables weldors to make all horizontal welds on transformer enclosures, thereby eliminating expensive handling delays and greatly improving weld quality.

The positioner is an L-shaped frame with a turntable on the short leg which traverses in and out. The frame, powered by a three-horsepower motor, rotates through a 90-deg arc, to lay the tanks on their sides. A jib crane hoists component parts into place for assembly.

Among the many advantages derived from this positioner is the release of 75 per cent of the available overhead cranes for use elsewhere in the plant. Also, the heretofore lengthy training program for weldors has been greatly reduced by minimizing the need for instruction in vertical and overhead welds. Over-all production cycles have been decreased by this simplified welding procedure, and by assuring a complete welding job before tanks are removed from the positioner.



NO TROUBLE CALLS WITH PUSHMATIC . . .

bolted connections are standard on every breaker

Ever hear of "nuisance tripping" in circuit breakers? It occurs regularly in many plants — boosting maintenance, hampering production, costing plenty. But not when Pushmatic® is on the scene. Here is a circuit breaker that thinks for itself — that puts an end to trouble calls. And here's why...

Unlike plug-in type breakers, a Pushmatic *bolts* to a bus bar, cannot work loose and cause excessive heating. It provides a high-pressure, low-resistant, *positive* connection always.

No complicated installation either. It can be installed simply and quickly by merely tightening a captive screw onto the bus bar.

Other Pushmatic plusses: Pushbutton convenience and control . . . quality you can depend on. More than a dozen individual tests are given each and every Pushmatic before packaging. The result is *proved* performance *every* time. Get Pushmatic and end trouble calls. © BEPCO

BULLDOG

BullDog Electric Products Company, Division of I-T-E Circuit Breaker Company, Detroit 32, Mich. *BullDog Export Division:* 13 East 40th St., New York 16, N.Y. *In Canada:* BullDog Electric Products Co. (Canada) Ltd., 80 Clayson Rd., Toronto 15, Ont.

For more facts circle 569 on Reply Card

NEW PLANT CONSTRUCTION —advance information on location, costs

Selma, Ala.—Alabama Metallurgical Corp. plans to construct a plant for the production of magnesium. Site preparation has begun for the $3.5-million facility which will have an initial capacity of 6000 tons of the light metal, starting late this year.

Tuskegee, Ala.—Sterling Pulp & Paper Co., 1200 Forest Ave., Eau Claire, Wis., plans to construct a large pulp and paper mill which will cost in excess of $15 million. When completed the plant will initially employ about 500 persons but with expansion of the Alabama operation it will eventually total about 3000 workers.

Martinez, Calif.—Shell Oil Co., 50 W. 50th St., New York, N. Y., has work under way on three new equipment improvements and storage projects at local refinery here. First is a control system designed to help prevent escape of oil vapors and solids through waste water into San Francisco Bay and into the atmosphere. The other projects involve construction of a 3,000,-000-gallon jet fuel storage tank and loading facilities and a 400,000-gallon pressure tank for butane. All three projects are expected to be completed by the summer of 1959 at a reported cost in excess of $1 million.

Torrance, Calif.—Garrett Corp., 9851 S. Sepulveda Blvd., Los Angeles, Calif., has acquired a large tract of land on which company proposes to build a manufacturing plant. Plans for the new plant are under way and construction will begin as soon as land negotiations are completed.

Pensacola, Fla.—American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y., plans to construct a small scale synthetic textile fibre production plant. Plant will be erected adjacent to major commercial production plant now under construction here. Small plant, to be completed late this year, will be a prototype unit which will permit continuing improvements in processes and products, and serve as a trial area for new equipment and techniques.

Augusta, Ga.—Continental Can Co., Inc., 100 E. 42nd St. New York 17, N. Y., plans to construct a huge bleached sulphate paperboard and paper mill on large building site located near here. Plant will be located on a 2600-acre tract, 11 miles south of this city on the Savannah River. Plant will cost about $50 million.

Chicago, Ill.—Silverman & Wexler, 3725 S. Halsted St., this city, plans major addition to meat packing plant located here. Company plans to let contract soon on one-story brick addition to company's present facilities which will cost about $125,000. Work should be completed by early 1960. Stuart Phillip, 185 N. Wabash Ave., Chicago, Ill., is the architect.

Illiopolis, Ill.—Borden Company, Chemical Division, 350 Madison Ave., New York, N. Y., is constructing a new coatings and adhesives plant on large site here, some 20 miles east of Springfield. New plant, to cost about $500,000, is expected to go on stream late in 1959.

Bluffton, Ind.—Franklin Electric Co. 400 E. Spring St. plans to construct an addition to plant facilities here. Plans call for the addition of a 150-ft by 200-ft production area along with an administration building addition measuring 40 ft by 200 ft. Work on the plant expansion will begin in the spring for completion by late this year or early 1960. Cost of additions reported to be approximately $300,000.

Pella, Iowa—Rolscreen Company plans to construct a new concrete building for the manufacture of windows and wood folding doors. New facility will have a floor area of approximately 15,000 sq ft, including a water tower with a capacity of 200,000 gallons. Cost reported to be in excess of $100,000.

Hopkinsville, Ky.—Colonial Bakery Co., 2407 Franklin Rd., Nashville, Tenn., plans to construct a large wholesale bakery plant on a six-acre building site on Skyline Drive. Plant reported to be a $1 million dollar project.

Lebanon, Ky.—Lebanon Industrial Development Board plans to construct a large concrete and tile dairy plant on city owned property located here. Plant will have an area of about 12,000 sq ft and, when completed late this year, will be leased to the Swift Company, 4115 S. Packers Ave., Chicago, Ill., for a long term period. Cost of the new plant reported to be in excess of $275,000.

Louisville, Ky.—Cochran Foil Corp., wholly owned subsidiary of Anaconda Company, 14th and Burnett Streets, Louisville, Ky., plans major expansion and addition to company's aluminum foil plant located here. Work will include a substantial building addition to provide more office space and additional space for plant operations. Major part of the $2-million expenditure will go for installation of two new 62-in. foil rolling mills.

Louisville, Ky.—Standard Gravure Corp., 525 W. Broadway, plans to construct a four-story administration and plant building on Chestnut St., this city. Contract has been let to F. W. Owens Co., 119 N. Fifth St., Louisville, Ky., in the amount of $1.5 million for the structure.

Versailles, Ky.—International Paper Co., Container Division, 220 E. 42nd St., New York, N. Y., plans to construct a plant here for the manufacture of paper milk containers. Construction of the new plant, with a capacity of 35,000,000 containers per month, will be completed by the end of the year.

Detroit, Mich.—Parke-Davis & Co., Joseph Campau Ave. and the River, this city, has announced a major expansion and improvement program over the next few years estimated to cost in excess of $50 million. Plans include remodeling of executive offices here at a cost of $2 million and research facilities at Ann Arbor, Mich., at a reported cost of approximately $12.5 million. The remainder will go toward combination branch offices and warehouses at Chicago, Ill., San Francisco, Calif., Kansas City, Kan., Baltimore Md., and Montreal, Canada. An amount of about $4 million will be devoted to manufacturing laboratories and branch offices in other countries.

Riverside, N. J.—Shell Chemical Corp., 380 Madison Ave., New York 17, N. Y., plans to construct a plastics plant on large building site here. Work will begin soon for completion by the spring of 1960. All State Design and Development Co., 25 N. Warren St., Trenton, N. J., is the engineer of the project reported to represent an investment in excess of $1 million.

Secaucus, N. J.—Merchants Refrigerating Co., Inc., 17 Varick St., New York, N. Y., plans to construct a large freezing and processing plant here. Plant, including a large warehouse for the storage of frozen foods, will have a capacity of 2,000,000 cu ft. Work will begin at once for completion by late 1960. Cost reported to be about $1 million.

Bethpage, N. Y.—Grumann Aircraft Engineering Corp. plans to construct an avionics engineering laboratory at plant site here, to be used for evaluation and development of avionic systems for aircraft, missiles and space vehicles. Work will begin soon on the $4-million project which includes a plant plus basic equipment. Completion date is planned for sometime late in 1960.

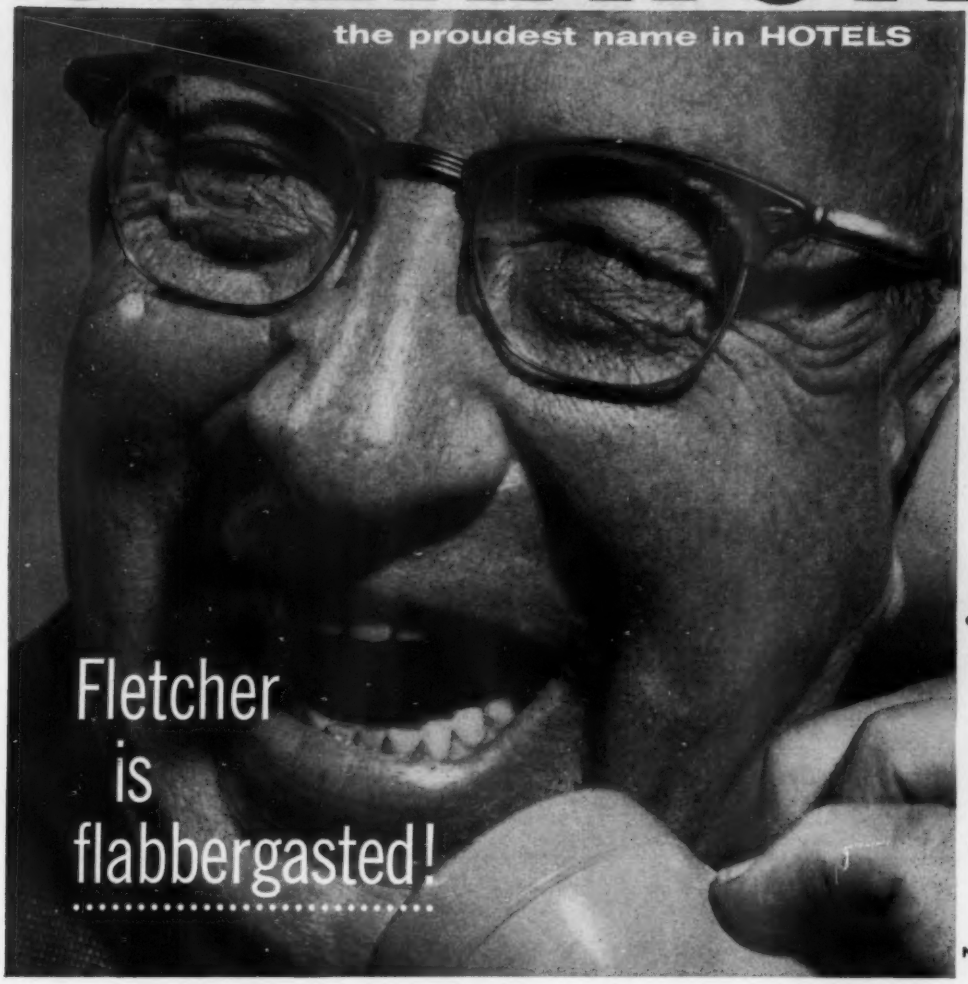
Hicksville, L. I.—Servo Corporation of America, Servo Building, 20-32 Jericho Turnpike, New Hyde Park, Long Island, N. Y., plans to construct new

(Continued on page 174)

For more facts circle 571 on Reply Card ——→

SHERATON

the proudest name in HOTELS



Which of these 39 cities is your next stop?

EAST
NEW YORK
BOSTON
WASHINGTON
PITTSBURGH
BALTIMORE
PHILADELPHIA
PROVIDENCE
ATLANTIC CITY
SPRINGFIELD, Mass.
ALBANY
ROCHESTER
BUFFALO
SYRACUSE
BINGHAMTON, N.Y.
(opens early 1959)

MIDWEST
CHICAGO
DETROIT
CLEVELAND
CINCINNATI
ST. LOUIS
OMAHA
AKRON
INDIANAPOLIS
FRENCH LICK, Ind.
RAPID CITY, S. D.
SIOUX CITY, Iowa
SIOUX FALLS, S. D.
CEDAR RAPIDS, Iowa

SOUTH
LOUISVILLE
DALLAS
(opens early 1959)
AUSTIN
MOBILE

WEST COAST
SAN FRANCISCO
LOS ANGELES
PASADENA
PORTLAND, Oregon
(opens fall 1959)

CANADA
MONTREAL
TORONTO
NIAGARA FALLS, Ont.
HAMILTON, Ont.

. . . Sheraton's ***RESERVATRON*** got him his hotel reservation in just 4 seconds!

A call to the nearest Sheraton Hotel sets in motion the world's fastest hotel reservation service. ***RESERVATRON,*** new electronic marvel, reserves and confirms your room in any Sheraton Hotel coast to coast in split seconds! For hotel reservations for your next trip, just phone Sheraton. Let ***RESERVATRON*** take it from there.

FREE BOOKLET to help you plan trips, sales and business meetings, conventions. 96 pages, describing Sheraton facilities in 39 major cities. **MEMBERSHIP APPLICATION** for the Sheraton Hotel Division of the DINERS' CLUB. This card is an invaluable convenience for the traveler — honored for all Sheraton Hotel services.

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Please send me, without obligation: ☐ Sheraton facilities booklet
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Address.....
City.....*Zone*.....*State*.....

For more facts circle 570 on Reply Card

Still the smallest 800-amp breaker in the business!

GENERAL ELECTRIC KM CUTS EQUIPMENT SIZE AND COST

Panelboards, switchboards and motor control centers are being reduced in size and cost by G.E.'s exclusive new KM breaker—6½ inches shorter and 30 percent smaller than the L-frame, with the same interrupting rating.

The KM replaces KL, L and M-frames in ratings from 125 to 800 amperes. Thus you can standardize on one compact size instead of three, cut down inventory investment, and have equipment which takes less valuable wall and floor space.

For every circuit protection need, General Electric offers a complete line of circuit breakers and matching enclosures. Plus all accessories including remote operating mechanisms, auxiliary switches, shunt trips, bell alarm switches and new plug-in mounting bases. Call your local General Electric representative to explain G-E benefits for your particular application. Write for Bulletin GEA-6754, General Electric Company, Plainville, Conn.

THE KM IS ANOTHER "FIRST" FROM GENERAL ELECTRIC'S FULL LINE OF CIRCUIT BREAKERS

GENERAL ELECTRIC

For more facts circle 664 on Reply Card

For More Facts circle 571 on Reply Card

It's a good feeling to see this trusted mark on your

STAINLESS STEEL VALVES *too*

JENKINS

®

Jenkins Bros

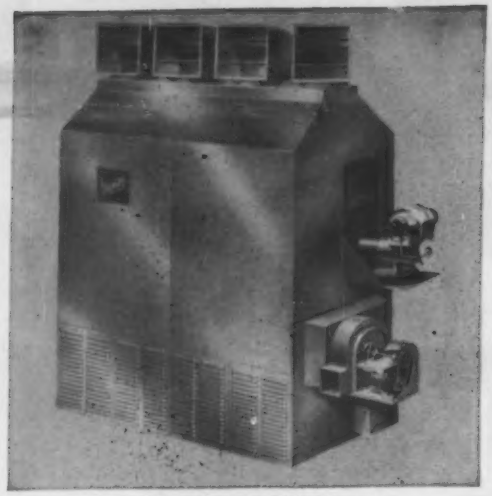
PATTERNS AND ALLOYS TO SATISFY MOST INDUSTRIAL NEEDS

For solid reasons, men who ask for the best in Stainless Steel Valves have full confidence when they see the Jenkins Diamond. For almost a century this mark has appeared only on valves made to peak standards of quality in design . . . in castings . . . in machining. JENKINS standards, enforced by the most rigid inspection and testing in the valve industry.

Valves of corrosion resistant stainless steels have been made to those high standards by Jenkins for a quarter of a century. And today, the line of Jenkins Stainless Steel valves includes types and alloys to fully satisfy most service requirements.

They are available through the same leading distributors everywhere who sell Jenkins Valves of Bronze, Iron and Cast Steel. Jenkins Bros., 100 Park Avenue, New York 17, N. Y.

NEW JENKINS STAINLESS STEEL VALVE CATALOG
Send for your copy today



Dravo *Industrial* heater

Dravo *Paraflo* heater and *Suspended Unit* heater

Dravo *Commercial* heater

ONLY DRAVO HAS ALL 4

1. **FULL LINE**—A size and type for every heating need
2. **DESIGN AND APPLICATION KNOW-HOW**
3. **NATION-WIDE SERVICE**
4. **RESEARCH**

Dravo's full line of heaters is backed by a highly trained and extensive service organization, with a reputation for dependability and thoroughness.

This is only one of the "extras" that benefit Dravo customers. The performance built into every Dravo heater is applied so that each installation functions with maximum efficiency. This is only possible because *every* Dravo technical representative *is a qualified heating engineer.*

Complete research and laboratory facilities conduct continuous studies of heater design problems. With the experience gained from over 10,000 installations, these studies result in basic improvements in all phases of both heater engineering and its application to unusual heating problems.

Make sure you get "ALL 4" when you are buying space heating. Only Dravo has the manpower, the technical background, and the facilities to assure your getting the most for your money. Write Dravo Corporation, Pittsburgh 22, Pennsylvania.

DRAVO
CORPORATION

For more facts circle 572 on Reply Card

For more facts circle 573 on Reply Card——→

FULL-LOAD TESTED!

Only G-E Ignitrons Come PROVED for Welding Service!

General Electric is the only builder of ignitrons to use test equipment which fully proves tubes under actual welding conditions. Tests are made at voltages and currents exceeding maximum requirements.

Occupying over 3,100 cubic feet of area, General Electric's extensive test equipment probes for—and rejects—any operating faults which might affect the performance of G-E ignitrons in your plant, such as improper ignitor firing, tube arc-backs, etc.

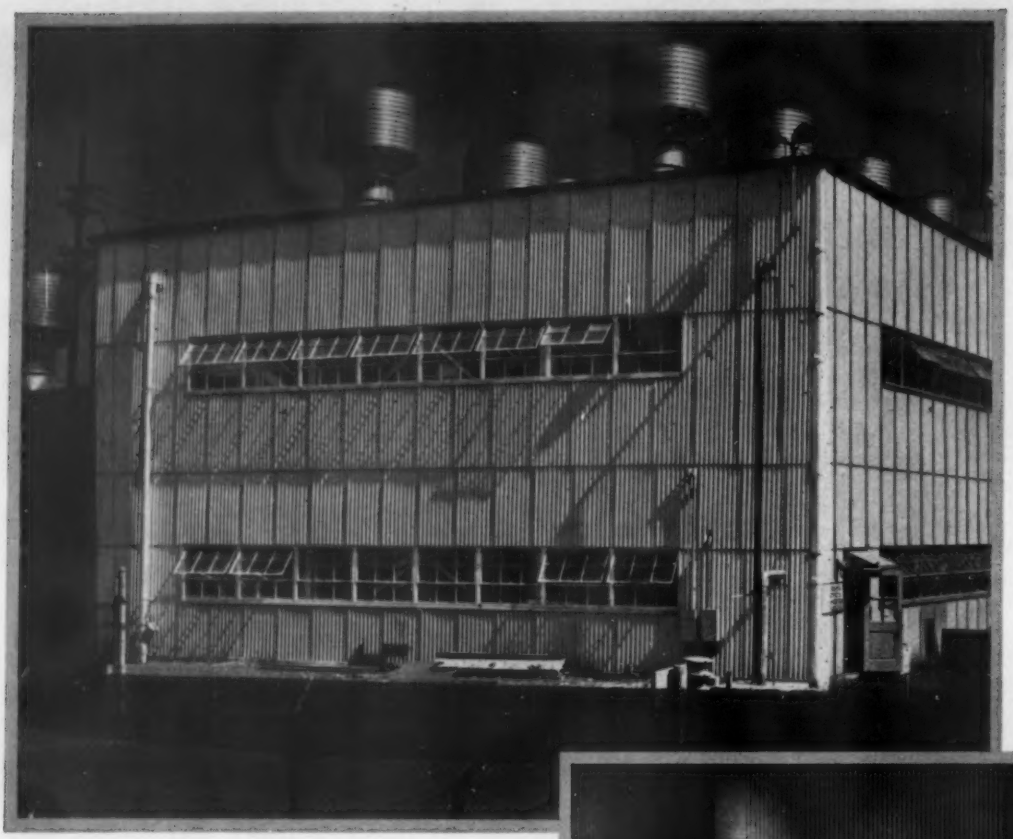
Here is unexcelled protection for your dollar investment in ignitrons! Here is the best possible assurance that your welder downtime will be kept low—that production will remain high.

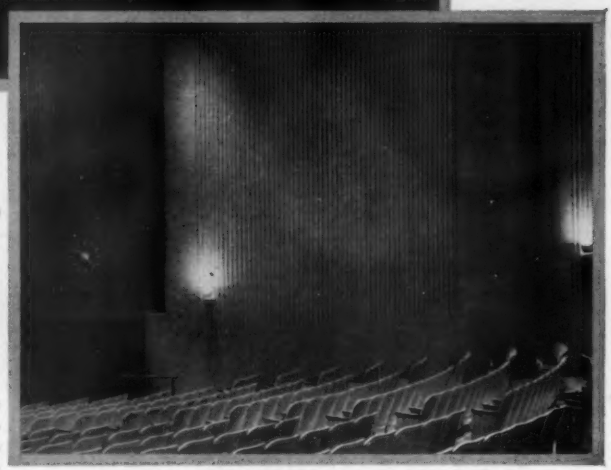
Install General Electric *full-load-tested* ignitrons! Made in the widest range of sizes and types. Fully competitive in price . . . stocked by a G-E tube distributor who is near you. Phone him! *Distributor Sales, Electronic Components Division, General Electric Company, Owensboro, Kentucky.*

Progress Is Our Most Important Product

GENERAL ELECTRIC

11-12-102





Johns-Manville
CORRUGATED TRANSITE®
cuts construction costs
. . . needs no maintenance

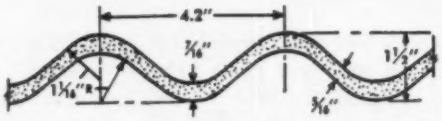
Made of two practically indestructible materials—asbestos and cement—Corrugated Transite looks and wears like stone. It actually becomes stronger and tougher with age. It can't burn, can't rot, can't rust.

Used for outside walls or roofing, Corrugated Transite is weatherproof and durable, requires practically no maintenance. Large sheets, low in first cost, require a minimum of framing, permit fast and inexpensive construction of industrial buildings as pictured above.

In the hands of an imaginative architect or engineer dramatic decorative effects can be obtained as in the case of the interior walls of the college auditorium illustrated at the right.

The natural color of Corrugated Transite is a light stone gray but it can be easily painted. Sheets can be combined with other building materials for contrast, variation or directional accent.

For a 32-page illustrated booklet, "CORRUGATED ASBESTOS TRANSITE," write to: Johns-Manville, Box 158, New York 16, N.Y. In Canada, Port Credit, Ont.

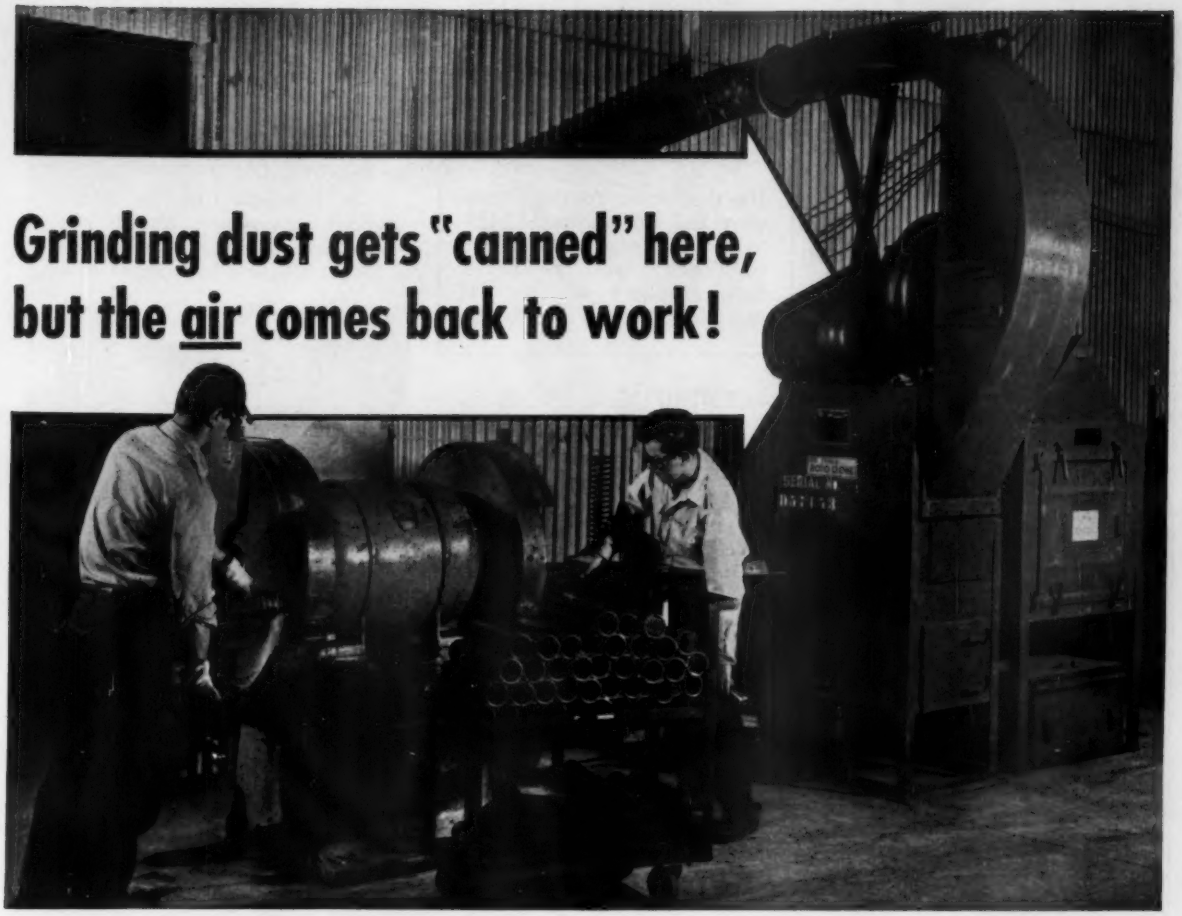


Corrugated Transite is available in sheets 42" wide (10 corrugations). Standard lengths are from 3' 0" to 12' 0" in increments of 6". Curved units are manufactured to order. Corrugated Transite may be applied to steel or wood framing.

JOHNS-MANVILLE JM PRODUCTS

JOHNS-MANVILLE

For more facts circle 574 on Reply Card



Grinding dust gets "canned" here, but the air comes back to work!

AAF ROTO-CLONE-Cycoil team saves money for Duer Spring Co.

AAF's team of Type D ROTO-CLONE and P-17 Cycoil is the ultimate in metallic grinding dust control. Duer Spring Company, McKees Rock, Pennsylvania, is an example. Here's what these units are doing for them: (1) eliminating *all* spring grinding dust, (2) saving on fuel bills by returning cleaned air to the workroom, (3) lowering maintenance costs by preventing oxidation to building.

The Type D ROTO-CLONE gets the first shot at the grinding dust and removes all but the very small particles. The dust that does get through this rugged dry collector is trapped by the high-efficiency P-17 Cycoil Oil Bath After-cleaner. The dust-free air exhausted by the Cycoil is returned to the workroom.

Get all the advantages of modern dust control. Call your local AAF representative or write direct for Type D ROTO-CLONE Bulletin 272A and P-17 Cycoil Bulletin 285A. Address: Mr. Robert Moore, American Air Filter Co., Inc., 228 Central Avenue, Louisville, Ky.

AAF American Air Filter
BETTER AIR IS OUR BUSINESS

For more facts circle 575 on Reply Card

NEW PRODUCTS AND PROCESSES summarized for your convenience

Edited by M. E. Heniken

1—HANDRAIL SYSTEM installs easily, looks neat

Contemporary styling and ease of installation are announced for this aluminum handrail system, as well as economy not previously obtainable with aluminum railings. Rail-to-post assembly, wall bracket connection, and base flange are made of precision machined components for accurate fit, according to manufacturer, and the railing will accommodate any stair angle. Field assembly is made possible by friction joints and special mechanical fasteners. Bolt anchorage to walls and floors is concealed, and neither pipe threading nor welding is required. Although the system has a natural aluminum finish, a bright appearance may be obtained by natural or colored Alumilite treatment. Aluminum Co. of America.

2—AIR VIBRATOR for precipitators, dust collectors

Designed to reduce maintenance problems associated with electrostatic precipitators and dust collectors, the Navco BH-3-SP Hi-Impact Vibrator is a heavy-duty unit of one-piece construction. According to manufacturer, there are no body assembly bolts and the piston is the only moving part. The vibrator can be arranged with timer and solenoid valve for automatic control. It weighs 52 lb, is 11 in. long, 5 in. wide and 10½ in. high. National Air Vibrator Co.

Use the Reader Service Cards provided on pages 181-182 to ask for more information on these products. Circle item numbers of products in which you are interested.

4—CENTRIFUGAL FANS for wide pressure range

Centrifoil Fans are designed for a wide range of pressures and volumes, with sizes from 440 cfm at ¼-in. static pressure for a single-width, single-inlet fan to more than 460,000 cfm at 16-in. static pressure for a double-width, double-inlet fan. Blades on these blowers have an airfoil shape, resulting in greater efficiency, silent operation and reduced horsepower, company says. Centrifoil Fans are claimed to meet requirements for industrial heating and ventilating applications, as well as those of a forced or induced draft nature. Joy Mfg. Co.

5—NEUTRALIZING AMINE for condensate systems

Neutrameen is a water soluble neutralizing amine prepared so as to have no flash point, and is for use in the control of carbon dioxide corrosion in steam condensate systems. Neutrameen is blended as a liquid, and supplied in steel drums and pails. Betz Laboratories, Inc.

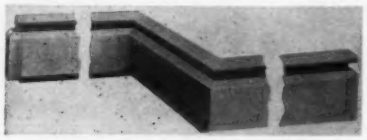
6—HEAVY DUTY PUMPS with helical gear reduction

Mounted on enclosed, formed steel bases, these pumping units are described as compact, quiet and suitable

for many types of heavy-duty applications. Included are four sizes from 35 to 150 gpm. Two speed ratios are now available; three others are planned. All of the helical gear reducers are interchangeable on units. Wider speed ranges permit easy changing of pump speeds for handling thick or thin liquids. Maximum pressures are 200 psi on lubricating liquids, 100 psi on the non-lubricating liquids. Viking Pump Co.

7—BASEBOARD HEATER installs in four steps

Heating panes of this electric baseboard heater come in 2-, 5- and 8-ft. lengths, and can be flush-mounted or recessed against studding. After the desired panel lengths are selected, the back panel containing the heating element is screwed or nailed into studs. Then power is connected to the splice



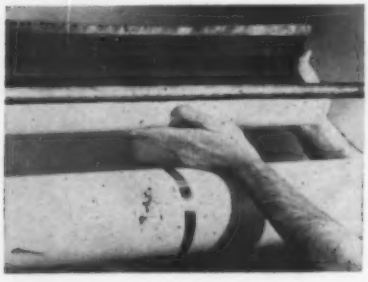
box by bringing in two wires from rear, bottom or sides using raceway. Cover panel is then snapped in place. The final step requires no more than snapping on end caps and corner pieces. Finished panels have a bonderized finish said to bond paint tightly without a primer. Company says the units meet temperature and electrical requirements of Underwriters Laboratories. Ilg Electric Ventilating Co.

8—FLEXIBLE CONDUIT comes in three types

Liquatite Type L.A., with continuous copper wire in the core, carries Underwriters' approval as required in various code specified installations, says manufacturer, and Liquatite Types H.T. and L.T. both meet J.I.C.

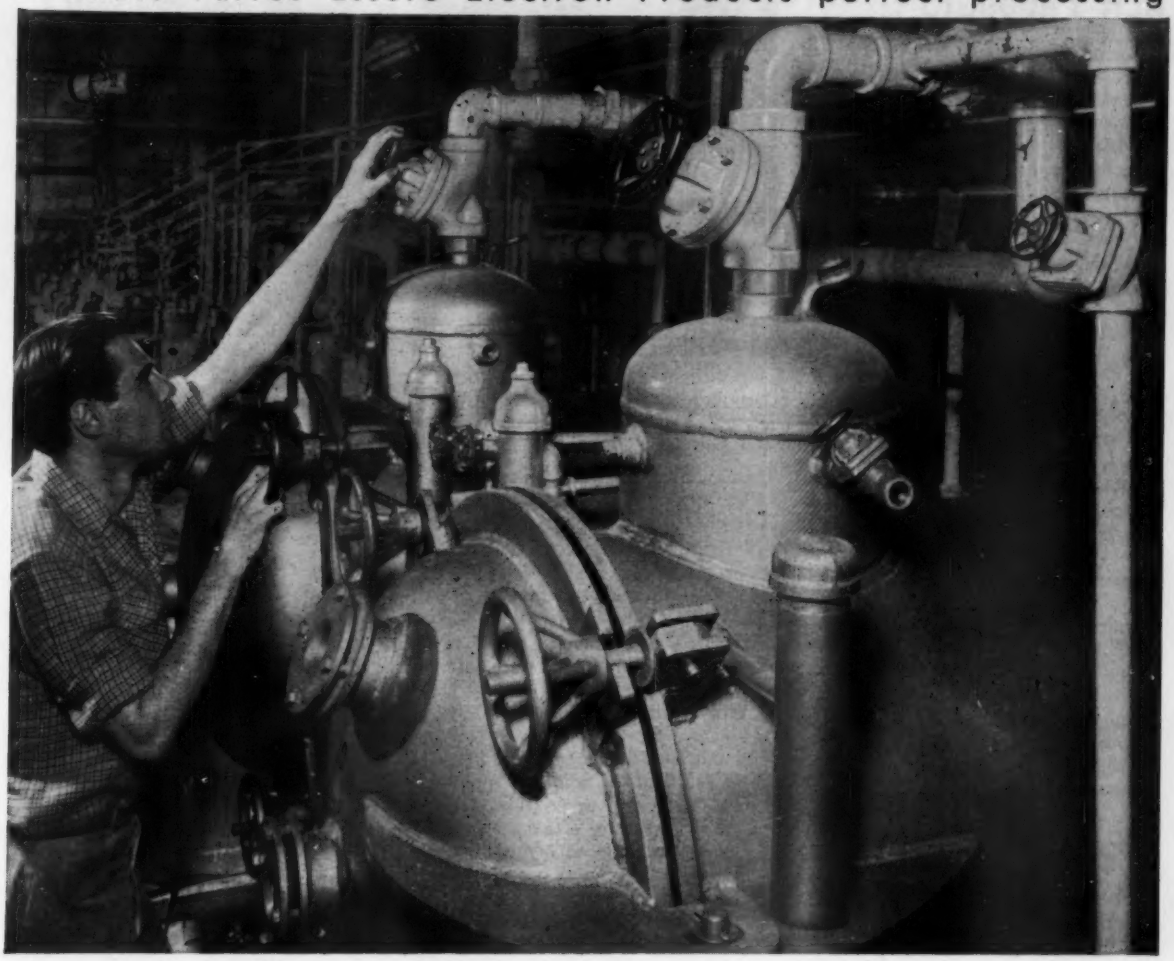
3—ECONOMICAL PIPE INSULATION of rigid cellular glass

Foamglas Stay-Dry Pipe Covering is a low-cost rigid cellular glass insulation for piping applications from 35 to 350 F. According to manufacturer, production economies permit offering this vapor-proof, incombustible and dimensionally stable Foamglas covering for about the same cost per linear foot as other commercial pipe insulations. The material comes in 24-in. lengths, factory-wrapped with a dual purpose kraft and aluminum foil laminate. The white laminate serves as a tough protective jacket with a neat finished appearance, or it can be painted with water-base paint.



Ease and speed of installation are stressed. Due to high compressive strength of Foamglas, the covering can be installed before or after hanging the pipe. Hangers can go around an insulated pipe section without compressing the insulation, it is stated, and it is not necessary to prime the pipe before applying the covering. The section opens lengthwise and fits around the pipe. The overlapping longitudinal seam of kraft-foil laminate is sealed with lapping cement and banded. End joints are sealed with vapor barrier strips furnished. Covering comes in thicknesses of 1, 1½ in. for ½- to 6-in. pipe or tubing. Pittsburgh Corning Corp.

Packless valves assure Electron Products perfect processing



Crane diaphragm valves still hold tight after 18 months on 100-micron vacuum service

Electron Products Inc., Pasadena, Calif., forms special electronic parts of metalized paper. Processing—drying, deaerating, impregnating—is done under constant vacuum.

Valves, to hold the critical vacuum within a maximum leak rate of 100 microns for a 24-hour period during processing, had to be selected with care. Obviously not any valve would do. The choice—Crane diaphragm valves for high performance value.

After 18 months, these Crane packless valves continue to hold tight on this critical vacuum service for as long as 36 hours—and on occasion, over an entire weekend.

Crane packless diaphragm valves are widely used also in processing industries where absolute tightness is necessary to prevent leakage of volatile, corrosive and hard-to-hold fluids. Complete information is available from your Crane Representative. Or write for 24-page circular.

All about Crane diaphragm valves—patterns, body and trim materials, linings, 180 tested service suggestions, etc.—in Circular AD-1942. Send for it today.

CRANE® VALVES & FITTINGS

PIPE • PLUMBING • HEATING • AIR CONDITIONING

Since 1855—Crane Co., General Offices: Chicago 5, Ill.—Branches and Wholesalers Serving All Areas

For more facts circle 576 on Reply Card

NEW PRODUCTS

(Begins on page 138)

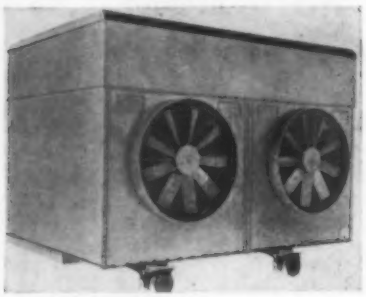
specifications. The former is designed to withstand temperatures to 220 F; the latter is for general duty applications. All types are made from heavy, spirally-wound, square-locked galvanized metal, either cord or wire packed for consistent bending diameters. The extruded polyvinyl jacket protects against oil, chemicals, water, corrosive fumes and other conditions. Liquatite comes in payout cartons or reels. Electri-Flex Co.

9—WEAR-IN COMPOUND protects new machinery

Molykote Wear-In Compound, a molybdenum disulfide compound, is announced as offering advantages in the reduction of damage during "wearing in" of new machinery. According to manufacturer, this compound shortens the "wear in" period without use of abrasives; reduces galling, seizing and excessive wear during this period; safeguards against expense associated with disassembly, repair and replacement of damaged parts, need not be burnished into the surface, is inexpensive—a little goes a long way. The Alpha-Molykote Corp.

10—COOLING TOWERS in capacities to 400 gpm

Three new models extend the capacity range of the packaged Aquatowers to 120 tons. The new models are two-fan units with divided hot water basin and dual cooling chambers



mounted on a "common" cold water collecting basin. The two-fan design permits single-cell operation, if desired, providing flexibility of operation and close control of cold water temperature. Increased capacities available make these cooling towers suited for many process water cooling applications in the 250-to 400-gpm range. Aquatowers are shipped as a completely assembled unit, but may be disassembled if necessary. The Marley Co.

11—FREEZER DOORS are flush-fitting plastic units

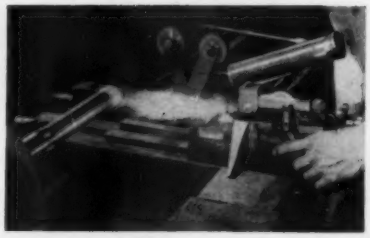
Jamolite Doors are announced as costing less than previous freezer doors of comparable insulating efficiency and as easier to open and close than wood or metal clad doors. Their weight is reportedly about a quarter that of metal-clad freezer doors. Frames and exteriors of Jamolite Doors are glass-cloth reinforced polyester plastic, impact resistant and easily wiped clean with soap and water or commerical cleansers. Foamed-in-place urethane plastic insulation adds support to exterior panels. The Jamolite Door comes in a range of colors and sizes in reach-in and walk-in cooler and freezer doors, vertical sliding package-passing doors and horizontal-sliding, walk-in doors. For most freezer and cooler applications, 4-in. thick Jamolite Doors are suggested; for severe freezer conditions, those with 6-in. thick insulation can be had. Jamison Cold Storage Door Co.

12—PULLEYS maintain speed regardless of load

Constant speed regardless of wide variations in load is a feature of the Hi-Lo FHP line of variable speed pulleys. This is accomplished by a cam which automatically maintains required belt tension for a given load, it is explained and thus, the pulley faces are prevented from spreading and the pitch diameter is held at desired setting. According to manufacturer, belts are never subjected to excessive pressure, since the contact springs serve only to maintain initial tension. Compact in both diameter and length, this economy line of pulleys includes sizes in ratings of ½, ¾ and 1 hp at 1750 rpm. The smallest unit is available with high impact plastic or cast iron face. Other sizes are cast iron. Speed ratios vary from 2 to 1 for the ½- and ¾-hp models, to 2½ to 1 for the 1-hp size. Lovejoy Flexible Coupling Co.

13—SILICONE RUBBER vulcanizes in half hour

Silastic RTV 502 is announced as an easy-to-apply liquid which vulcanizes to a rubber in only 30 min—about 20 times faster than many RTV (room temperature vulcanizing) silicone rubbers. It is said to retain flexibility from —70 to 500 F and have good insulating properties, and to resist weathering, moisture, ozone and corona like regular heat-cured silicone rubber. Company says Silastic RTV 502 is suitable for sealing and caulking metal-to-metal and metal-to-rubber joints; potting and encapsulating electrical and electronic parts; as a mold or impression material for making prototype parts; as a shock and vibration absorber for delicate components. Dow Corning Corp.



14—TUNGSTEN CARBIDE SPRAY for hard facing

This spray-powder material is claimed to permit hard facing with sprayed tungsten carbide at high deposit efficiency—better than 90 per cent and high concentration of the carbide. Coating speeds are also claimed high —110 to 150 sq ft per hr, 0.001 in. thick. Any required coating thickness may be applied. Coatings are torch-fused after spraying and the close control of coating thickness permitted, plus the comparatively smooth surface, is expected to find application on parts subject to extreme wear conditions. Bulletin 139 gives details. Metallizing Engineering Co., Inc.

15—COMBINATION UNIT is oil reservoir, pet-cock

This combination oil reservoir and pet-cock unit is designed to simplify the filling and bleed of its air-oil tandem cylinders that provide hydraulic operation from shop air. The pet-cock is located immediately below the oil reservoir. Installation consists merely of threading the unit into the cap and port of the hydraulic cylinder section of the tandem cylinder. Although the unit requires only a few cubic inches of space, the oil reservoir is claimed large enough to allow direct pouring of oil through it (without use of a funnel) into the hydraulic circuit.

the Bigger the job, the More it needs

DIAMOND
ROLLER CHAIN

• This giant 425-thousand-pound boring, drilling and milling machine, built by The G. A. Gray Company, uses 44 feet of double strand DIAMOND Roller Chain.

For every roller chain application *traditional Diamond quality* assures long life of dependable, trouble-free service.

Always specify DIAMOND wherever roller chain is used. Your nearby DIAMOND Distributor has all types and sizes of Roller Chain in stock, ready for instant delivery. For the name of your nearest DIAMOND Distributor consult the Yellow Pages of your telephone directory under the heading CHAINS or CHAINS-ROLLER. Call him Now!

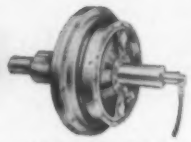
DIAMOND ROLLER CHAINS

DIAMOND CHAIN COMPANY, INC.
A Subsidiary of American Steel Foundries
Dept. 614, 402 Kentucky Avenue, Indianapolis 7, Indiana
Offices and Distributors in All Principal Cities

The head of this machine weighs 27,500 lbs. and operates with a precision of ¼ thousandths of an inch. Two 22-foot DIAMOND Roller Chains, operating over 15-tooth sprockets, insure smooth, dependable operation in this counterweight application.

For more facts circle 577 on Reply Card

DODGE PRODUCTS you should know



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DODGE
of Mishawaka, Ind.

For more facts circle 578 on Reply Card

NEW PRODUCTS

(Begins on page 138)

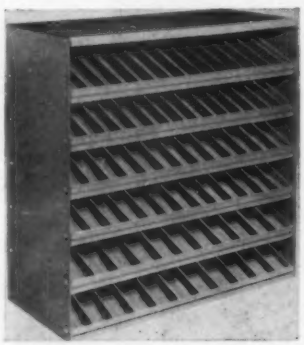
Once the latter is filled with oil, bleeding becomes a matter of opening the pet-cock to allow trapped air to escape. The oil-filled reservoir serves as a convenient source of make-up oil in case of leakage in the hydraulic piping. Opening the pet-cock lets make-up flow into the circuit. The unit fits all sizes of company's air-oil tandem cylinders. Miller Fluid Power Div., Flick-Reedy Corp.

16—THREAD COMPOUND for high temperatures

Now based on a new formula, this manufacturer's anti-seize thread compound for high temperature service is said to retain its homogenized consistency indefinitely, and to be non-settling, non-skinning, and non-hardening in the can. Effective lubricating and anti-seize properties at temperatures to 1050 F are announced. The compound is highly adherent, will not run or drip from vertical joints or under high heat exposure, it is claimed; also it will not harden, shrink or crumble on application, it stays flexible inside of joints, and has no deteriorating effect on piping materials. It can be used on threaded pipe joints, bolt studs and for coating gaskets for service under high temperature and high loading. Crane Co.

17—TOOL STORAGE UNIT has 78 compartments

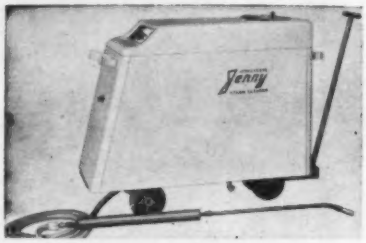
Model 181 has 78 individual compartments for drills, reamers, taps and other tools. The unit's two top



shelves have 15 compartments, each 2 5/16 in. wide; its two center shelves, 13 compartments, 2 5/16 in. wide; and its two bottom shelves, 11 compartments 3 in. wide. Of heavy gage steel, the unit is finished in baked enamel in gray or green. Shelves have label holders, turned up to form bin fronts. The unit is 33½ in. wide, 16½ in. deep and 34 5/8 in. high. It can be used alone or will fit into standard shelving arrangements. Penco Div., Alan Wood Steel Co.

18—STEAM CLEANER is electrically operated, heated

Designed for cleaning or sanitizing in confined areas where fumes, smoke, flame or excess water would be objectionable or hazardous is the Model E-350 Hypressure Jenny. This electrically powered and heated

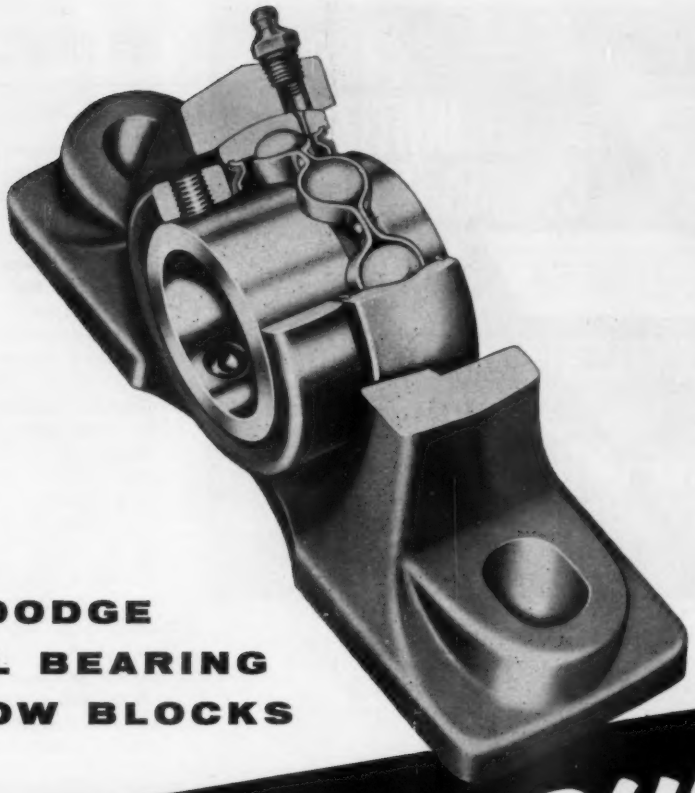


steam cleaner is suggested for average light to medium cleaning jobs and for Jenolizing (a process designed to prevent flash rusting of equipment and imparting a gloss to painted surfaces). Its relatively low water output, quiet operation and freedom from flame permit use in many applications.

It is stated that 90 sec after pressing the motor switch, turning on the heaters and setting the solution-concentration metering valve, the E-350 is ready to clean. Features announced include protection against damage by automatic shut-off of heaters in case of water supply failure; light to show when heaters are on; hose protector plug to prevent damage from superheated steam; and valve to automatically release excess pressures if line restrictions occur. The cleaner is available with wiring for either 220- or 440-v, three-phase, 60 cycle a-c. Homestead Valve Mfg. Co.

19—FIRE HOSE is made to stand rough treatment

Imperial Hose, made with Dacron jacket, designed for heavy-duty service in oil refineries and chemical plants, is now recommended by manufacturer for fire service wherever the going is rough. According to company, Imperial Hose can be soaked in mud holes, strung out in dank underground areas or hung in an atmosphere heavy with acid fumes, without hurting the hose—and it is so tough that a truck can run over it without causing a burst. The flexible single jacket hose is designed to withstand surge pressures beyond its initial 500 psi pressure test. It is claimed to have exceptional resistance to abrasion and



DODGE
BALL BEARING
PILLOW BLOCKS

PRECISION BUILT
– for normal and medium duty jobs

SC

NORMAL DUTY
SHAFT SIZES — 1/2" to 2-7/16"

SCM

MEDIUM DUTY
SHAFT SIZES — 1-7/16" to 3-1/2"

CALL THE TRANSMISSIONEER—your local Dodge Distributor. Factory trained by Dodge, he can give you valuable help on new, cost-saving methods. Look in the *white* pages of your telephone directory for "Dodge Transmissioneer."

- ★ High quality at moderate cost.
- ★ Deep groove ball bearing provides high radial and thrust capacity.
- ★ Long inner race distributes load over greater shaft area.
- ★ Metal backed synthetic seals are locked in position. They can't blow. Effectively exclude dust and dirt.
- ★ Completely sealed both on and off the shaft.
- ★ Fully self-aligning.
- ★ Rugged one-piece semisteel outer housing.

Pillow blocks, flange bearings, piloted flange bearings, cylindrical units, hanger bearings, screw conveyor hanger bearings.
Call your local Dodge distributor — or write us for technical bulletin.

DODGE MANUFACTURING CORPORATION, 2700 Union St., Mishawaka, Ind.

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of Mishawaka, Ind.

For more facts circle 579 on Reply Card

*

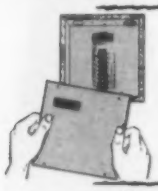
GTC

*an effective, economical industrial communication system designed to provide swift and sure voice communications regardless of distance or surrounding noise conditions.

. . . THE UNITIZED COMMUNICATION SYSTEM . . .

COMPLETELY TRANSISTORIZED AND DESIGNED TO MEET THE CRITICAL REQUIREMENTS OF INDUSTRY

1. An effective, economical industrial communication system designed to provide swift and sure voice communication under adverse environmental conditions such as extremes of temperature and noise.



2. All amplifiers are "plug-in" contributing greatly to ease of installation and MAINTAINABILITY.

3. Transistors and rugged, industrial type components are used throughout. No vacuum tubes or "entertainment" type components of any kind are employed.

4. Central Control cabinet is eliminated thus reducing space requirement to a minimum.

5. ULTRA SIMPLE WIRING PLAN (no shielded cables) and UNITIZED EQUIPMENT with integral terminal facilities make for EASY LOW COST INSTALLATION and LATER EXPANSION.

* GAI-TRONICS TRANSISTORIZED COMMUNICATIONS

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GTC is extremely flexible in application. Write today for a copy of our completely illustrated, descriptive booklet and name of nearest representative.

For more facts circle 580 on Reply Card

NEW PRODUCTS

(Begins on page 138)

to be impervious to mildew, oil, acids, alcohols, hydrocarbons and detergents. Tests are reported to show that it outlasts conventional single-jacket hose seven-to-one, rubber-covered hose three-to-one.

Ends of the hose are reinforced with company's Plylock protection. Oil proof rubber used for hose tube permits a thinner tube, so that Imperial Hose, size for size, delivers more water faster than other hose because its inner diameter is enlarged without increasing its outer dimension, company states. It comes in four sizes from 1 to 2½ in. B. F. Goodrich Industrial Products Co.

20—DRYER-RECEIVER supplies cleaned air

This single unit is a compressed air receiver tank with built-in dryer. Its double purpose is to purify and dry air to zero-dewpoint quality, and then to store and deliver the air clean and free of moisture to overcome fouling,

corroding and freezing of instruments, air tools, controls, chemicals etc. Manufacturer says the process can be operated from large centralized "plant size" air station or small scattered units. The compact, single-vessel design is claimed to require minimum space, installation and maintenance. It operates without heat, regeneration or regulation, company notes, and with no volume loss and less than 1 per cent pressure drop. Capacities range to 8000 scfm and 6000 psig. Bulletin D-R gives details on the unit. Van Products Co.

21—SHAFT MOUNTED DRIVE has increased torque rating

The 315GJ is an all-steel shaft mounted drive with increased torque rating of 41,000 lb-in. at the low speed shaft. With a ratio of 25:1, this unit covers applications from 3 hp at

For more facts circle 581 on Reply Card →

Good bet: You're paying for lubricants you don't need

Does this case sound familiar to you?

A midwest firm was buying lubricants on the recommendation of every department head, foreman or even operator. Inventory — often duplicated — was scattered all over the plant, yet shortages in one spot were never related to overstocks in another. The result: costly overstocking, extra handling, increased dangers of misapplication.

Management then instituted an Organized Lubrication Plan. Now they use 20 lubes instead of 97, have cut their purchase orders from 300 to 12 per year. Direct savings are estimated at thousands of dollars annually.

Can Organized Lubrication save money in your plant? Contact your local Texaco Engineer or write for "Management Practices that Control Costs via Organized Lubrication." The Texas Company, 135 East 42nd Street, New York 17, N. Y., Dept. E-80.

LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

TUNE IN . . . Metropolitan Opera
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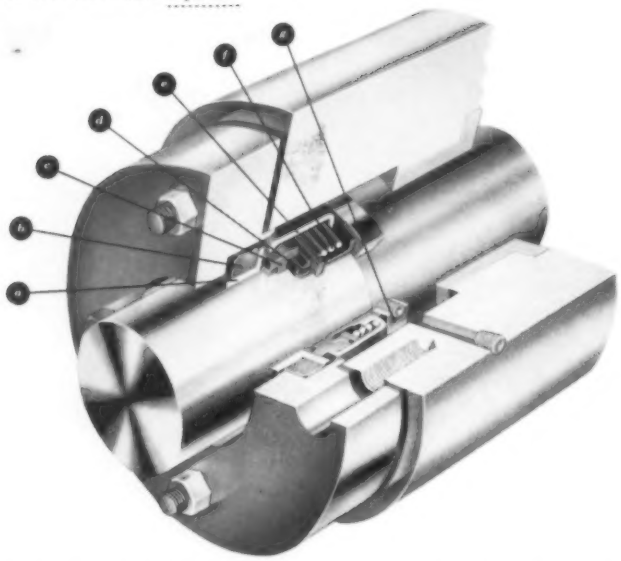
ONE OF THE GARLOCK **2,000**



GARLOCK Mechanical Seals —self-contained for easy installation, less downtime

*a. **Stationary Seat** of ceramic, Ni Resist, or bronze has precision lapped sealing face for perfect contact with carbon ring.*

*b. **Vibration Ring** of Buna-N positions stationary seat in a flexible mounting and acts as static seal.*

*c. **Seal Ring** of carbon is also precisely lapped to match sealing face of stationary seat.*

*d. **Roll type Bellows** permits free movement of seal ring.*

*e. **Shell**, encases entire rotary unit and furnishes mechanical drive for seal ring.*

*f. **Stainless Steel Spring** with load precisely calculated to face area of seal.*

*g. **Stop Collar**, or shoulder, positions seal to specified operating length.*

Garlock's PK MECHANIPAK* is designed to avoid excessive downtime. Self-contained, it can be installed simply and quickly, and eliminates adjustment during operation. Seal life is equal to many sets of conventional packings. Check these additional advantages:

Leak-proof sealing. Sealing faces of rotating and stationary parts are precision lapped for perfect contact, thus preventing leakage.

Elimination of shaft wear. No parts of the seal move on the shaft or sleeve, thus removing the danger of scoring or wear.

Maximum operating conditions are 212° F temperature, 150 psi pressure, 2000 fpm shaft speed. Available in shaft sizes from ⅜″ to 3″, PK MECHANIPAK Seals are another of the Garlock 2,000 . . . two thousand different styles of packings, gaskets, and seals for every need. Find out more by talking with your local Garlock representative, or write for Catalog AD-150.

*Registered Trade Mark

THE GARLOCK PACKING COMPANY, Palmyra, N.Y.

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GARLOCK

Packings, Gaskets, Oil Seals, Mechanical Seals, Molded and Extruded Rubber, Plastic Products

CANADIAN DIVISION: The Garlock Packing Co. of Canada Ltd.
PLASTICS DIVISION: United States Gasket Company

For more facts circle 582 on Reply Card

NEW PRODUCTS

(Begins on page 138)

5 rpm to 30 hp at 50 rpm. Features announced include: extra-depth, high pressure angle helical gears with greater load carrying capacity and maximum mechanical efficiency; all steel three-wall housing to maintain rigid alignment of revolving elements and to withstand external impact; inspection covers to check gears and bearings; dipstick for quick check of oil level. Bulletin 7100 Supplement gives details. The Falk Corp.

22—CHAIN VISE has large handle right up on top

Rigid No. 450 Tristand Chain Vise is said to eliminate knuckle busting and speed pipe work. It features a large, easily operated chain tightening

handle right on top of the vise base where it's handy for fast operation. Handle and tightening nut are anchored to the base. Weighing only 42½ lb, this unit has a capacity of ⅛ to 5 in., and it serves as a complete, portable workbench. Folding legs with built-in tray are readily set up and lock in position for work support. When folded, the legs chain together for carrying. The Ridge Tool Co.

To receive product data circle item numbers on the handy Reader Service Cards provided on pages 181-182.

23—PACKAGE BOILER has some "big boiler" features

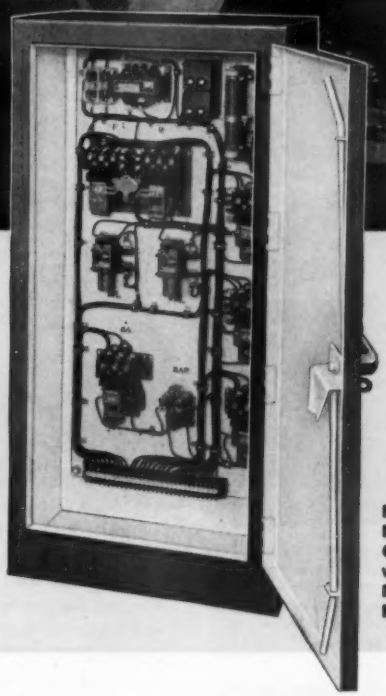
The Monitor is a space-saving package boiler for small, high-pressure steam-using plants. It is designed to provide low-cost dry steam for dairies, canneries, food processing plants and similar applications. It is furnished complete with integrated boiler,

new

EC&M

"VL" AC CRANE CONTROL

for light industrial* crane service



Form VLRP Reversing Controller with Frequency Plugging Relay

• Designed specifically for light industrial AC cranes, EC&M's full magnetic "VL" control assures smoother, more efficient operation than manual control. On cab-operated cranes, operators have greater freedom of movement with small masters mounted up-front and controllers at rear of cab. "VL" control is also available for cranes operated from floor by pendant push-button master.

EC&M "VL" Controllers are compact and have vertical-action type contactors. The well-known EC&M Frequency Relay provides accurate control of accelerating operations on Dynamic Lowering hoists. Timed acceleration is provided for Reversing hoist, Bridge or Trolley controllers. "VL" controllers have "individual protection," eliminating the need for separate protective panel. They are front-connected and wired for easy inspection and maintenance.

A companion line to EC&M's "PT" Control for DC cranes, this new "VL" control is far superior to manual control previously specified purely on the basis of price.

**NEMA Service Classification II applications*

Write for Bulletin 6431 for complete details

THE ELECTRIC CONTROLLER & MFG. CO.

A DIVISION OF THE SQUARE D COMPANY

CLEVELAND 28 • OHIO

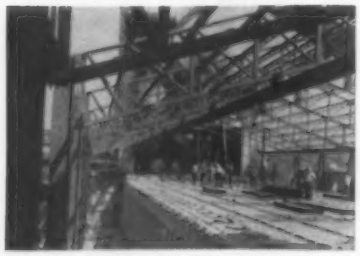
1587

For more facts circle 583 on Reply Card

5 MEN AND A CRANE; 45 TOTAL MAN-HOURS

That, in a nutshell, is the total of erection cost items for this Pittsburgh district industrial building covering an area 70 feet by 170 feet; 18 feet elevation at the eaves!

Truss halves are keyed together on the ground and raised in one unit for locking in place at the side columns. In center column construction, half-trusses are raised and locked in place at ridge and eave.



Erection of Swiss-Lok frames proceeds over and around other construction activity, as in the case of this construction of brick ovens.

And it's the same story everywhere Swiss-Lok tubular building frames are being erected. Riveting, cutting and welding, together with related equipment are all eliminated from the construction site. That's why Swiss-Lok rigid frames cost you less in place. Trusses, columns, purlins and girts are delivered at the site prefabricated and ready for fast, simple, slip-fit erection. The only tools needed on the job are hammers and a wrench for the foundation bolts.

As a bonus, you get strength *exceeding* A.I.S.C. requirements with ⅓ less weight, ⅓ less freight than conventional structural steel.

Swiss-Lok steel tubular framing can be used for any type of building layout and construction, whether commercial, industrial or institutional. Any desired wall and roof material is applicable. Swiss-Lok framing is rigid and does not rely on wall construction for support.

For construction to be done by in-plant personnel, factory supervision is available.

Write for literature fully describing the application of the Swiss-Lok principle to modern building construction and how it can reduce your construction costs.

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Manufacturers of Swiss-Lok Scaffolding and Shoring

Swiss Fabricating, Inc.
Camp Horne Road,
Pittsburgh 2, Pa.

Please send me your descriptive bulletin on Swiss-Lok tubular building frames. PE

Name.....
Company.....
Address.....
City, zone, state.....

For more facts circle 584 on Reply Card

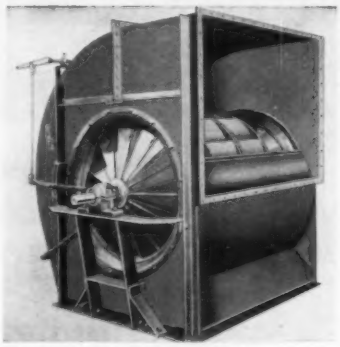
NEW PRODUCTS

(Begins on page 138)

burner, controls. The boiler itself is a four-pass horizontal fire tube unit with 5 sq ft of heating surface for each rated boiler horsepower. Of forced draft design, it requires only a simple roof vent to remove combustion gases from boiler room, manufacturer points out. The boiler can be oil-or gas-fired—some sizes are available for combination firing. It comes in 15- to 60-hp sizes. Cleaver-Brooks Co.

24—FANS for mechanical draft, heavy duty use

Incorporating an advanced airfoil, backward curved blade design, the Type AF Dynafoil Fan is reported particularly adaptable to mechanical draft and heavy-duty applications.

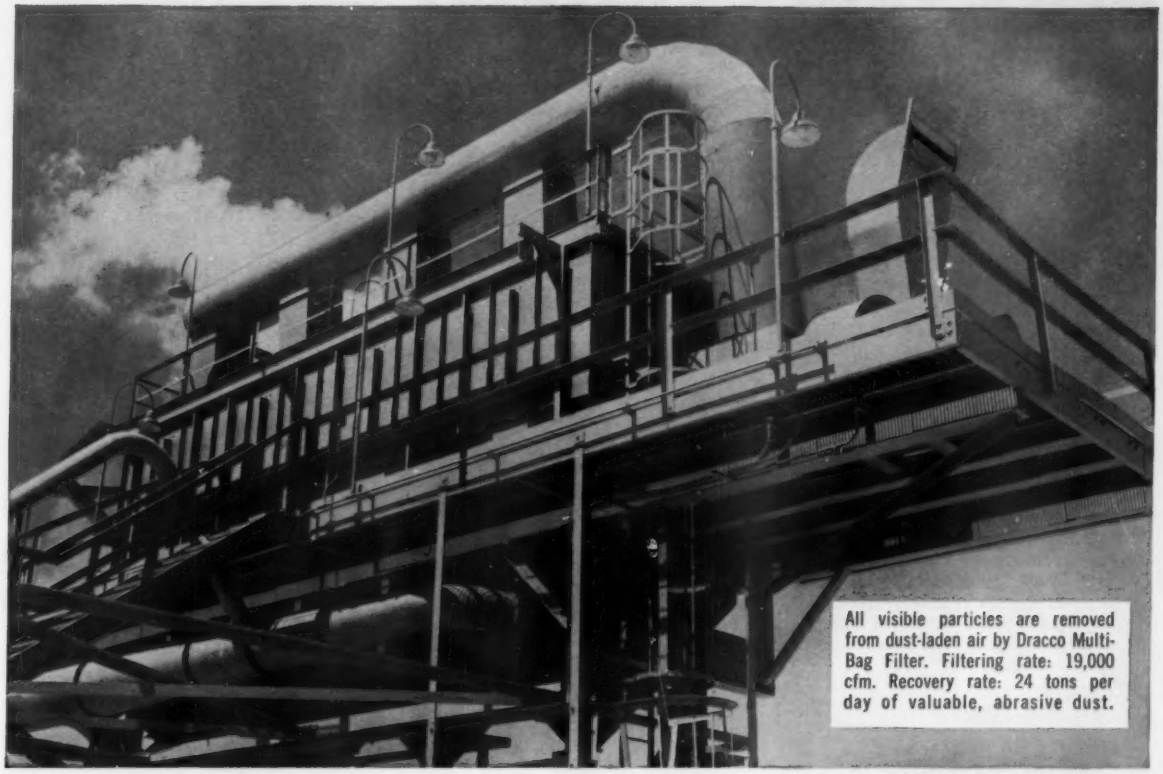


The wheel is built with 12 aerodynamically shaped blades which, in combination with the streamlined contour of the inlet, permits a continuously smooth flow of air through the fan. Turbulence is consequently minimized, it is pointed out, making the fan efficient and quiet. The fan comes in 13 sizes for mechanical draft and in Class II, III and IV for heavy duty industrial applications. The fans are also suited for air conditioning systems, tunnel ventilation. Catalog 905 gives details. Clarage Fan Co.

25—VERTICAL MOTORS for outdoor applications

This line of NEMA Type II vertical weather protected motors for heavy duty industrial applications is designed for year-round use where continuous operation under severe weather condititons is necessary. They are the vertical counterpart of company's horizontal weather protected motors. The vertical motor features direct blow-through passages, permitting high velocity air to pass through motor

Reynolds foils dust problem



All visible particles are removed from dust-laden air by Dracco Multi-Bag Filter. Filtering rate: 19,000 cfm. Recovery rate: 24 tons per day of valuable, abrasive dust.

Consulting Engineer: Bechtel Corp.

Dracco Filter recovers 24 tons per day of −44 micron alumina dust

Reynolds Metals Co. likes to keep its plants as clean as its rolls of shiny aluminum foil. So they installed Dracco Dust Control Equipment at their Sherwin Plant, Corpus Christi, Texas, to trap ultra-fine dust created in material handling operations.

Dependable, economical service gained from another Dracco Filter installed at this plant five years ago was the reason Reynolds specified Dracco again.

All collected metallurgical alumina dust is efficiently returned to process, assuring a waste-free production cycle. Problems of abrasive machine wear, high clean-up costs and poor working conditions are avoided.

If you want to obtain these cost-saving benefits for your dust collection problem, call in a Dracco engineer. Call or write:

DRACCO DIVISION OF FULLER CO.
4035 East 116th Street • Cleveland 5, Ohio

With Dracco Dust Control Equipment You Can —

- recover valuable dust from process
- eliminate health and safety hazards
- improve working conditions
- stop abrasive wear on machinery
- protect vital materials from contamination
- cut plant housekeeping costs
- halt air pollution

Complete 40-page catalog on Dracco Dust Control Equipment contains detailed data and valuable reference material. Write for Bulletin 800.

DRACCO *airstream* conveyors
dust control equipment

For more facts circle 585 on Reply Card

TENNANT Industry's most complete line of POWER SWEEPERS

TENNANT Model 40 Sweeper

HERE IS America's most complete and widely used line of power sweepers . . . for plants of all sizes.

If your plant is not already using a TENNANT Sweeper, you'll be surprised at its performance . . . and the savings it can bring you.

FOR CONGESTED AREAS—A compact NEW walk-behind Sweeper (Model 40). Cleans 32" path, turns in its own tracks. *Equals "big sweeper" performance for* CLEAN *sweeping!* Sweeps 8 to 20,000 sq. ft. per hour in most plants . . . or 2 to 5 times faster than a man with a broom. Very powerful brush-and-vacuum system: out-performs any other sweeper of its size for clean, dust-free work. Low priced.

FOR SMALL PLANTS — Versatile space-saving Sweeper (Model 50) cleans 40" path on the run. Travels at 1½ to 8 mph, *sweeping 3 to 7 times faster than is possible by hand.* Rider-type; easy to use. Combined brush and vacuum system instantly removes chips, sand, debris, dirt and dust that pushbrooms can't pick up.

Compact design and easy steering make the "50" ideal for both congested and open areas. Often pays for itself in 9 to 14 months. Gas or LP-gas models.

TENNANT Model 50 Sweeper

TENNANT Model 80

FOR HEAVY DUTY SWEEPING—The superbly engineered Model 80 is *industry's choice for rugged, 'round-the-clock sweeping.* Has no equal for performance. Cleans 53" path. Sweeps up to 110,000 sq. ft. per hour in open areas, yet is "aisle-designed" to operate efficiently in aisles as narrow as 5 ft.

Easy to operate: starts, stops, reverses instantly. Dirt hopper holds up to 800 lbs., dumps hydraulically in 10 seconds. Gas or LP-gas models; similar electric powered model available.

FOR MAXIMUM CAPACITY, here is the giant Model 100. *Has 3 to 4 times the capacity of smaller sweepers.* Cleans 7' 4" path, yet has turning radius of only 9' 2". Hydraulic dump hopper holds almost 2 yards.

Excellent dust control and huge capacity make it ideal for yards, docks, salvage work, large aisles, etc. Nothing else like it!

Write today *for illustrated bulletins on Tennant Power Sweepers. Get details on how to reduce your sweeping costs.*

TENNANT Model 100 Sweeper

G. H. TENNANT COMPANY, 7718 N. Lilac Drive, Minneapolis 22, Minnesota

SPECIALIZED MAINTENANCE EQUIPMENT

POWER SWEEPERS • FLOOR MACHINES • SCARIFIERS • ROOF SCRAPERS • CONCRETE ROUTERS

For more facts circle 586 on Reply Card

NEW PRODUCTS

(Begins on page 138)

without entering active parts. It also has a series of low velocity air lifts combined with labyrinth turns and baffles to precipitate any moisture or other contaminants before ventilating air reaches electrical parts. Motor comes in typical vertical configurations, such as solid shaft, hollow shaft, self-release couplings and non-reverse ratchets. General Electric Co.

26—BLOW-OFF VALVE for medium pressure service

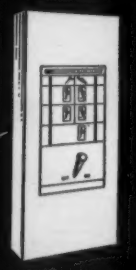
The Yarway Unit Tandem Valve, for boiler blow-off pressures to 665 psi, basic rated pressure 400 psi, is announced as offering all features of the original Yarway Unit Tandem Blow-Off Valve and at a competitive price. A forged steel block forms a

common body for both hard seat blowing valve and seatless sealing valve. The former is of the Welbond type with integral welded stellite seat. According to manufacturer, this design permits no leakage between seat and body. Valve stem is Type 303 stainless steel. Parts in the seatless sealing valve are interchangeable with company's Type B Seatless Blow-Off Valves. Tandem valves in the new medium pressure line are available with flanged or welding ends, right- or left-hand assembly. Bulletin B-435, Supplement A provides details. Yarnall-Waring Co.

27—FIRING SYSTEM for oven processing application

This indirect-firing system for heating is expected to benefit users of ovens, where products of combustion are undesirable, where end-products must meet high standards, as in paint. Two chief features are the manifolding employed, and method of handling large volumes of recirculated air. Manufacturer plans to incorporate

get centralized power distribution at low cost

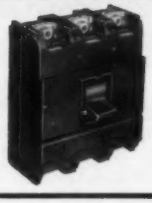


Power Distribution Panels

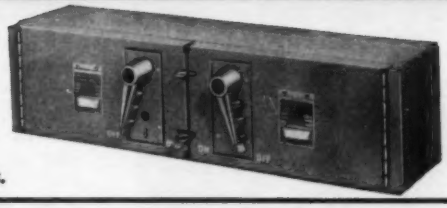
Motors

Lighting Panels

with new shallow depth switchboards



A.



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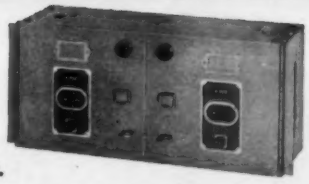

C.

Here is versatility you never dreamed possible in switchboard design. Only 14 inches deep and rigidly constructed of prepunched, formed 11 gauge steel channels... these switchboards take a variety of interchangeable control and distribution units of modular dimension, giving a new degree of flexibility and centralization of power distribution equipment. Advantages: consolidates all of your motor starters, fusible switches, and circuit breakers into a professional looking installation with less floor space, lower installation and maintenance costs and greater flexibility in meeting future requirements. For complete details write today for Bulletin #3-310, Federal Pacific Electric Co., General Offices: Dept. 310, Newark 1, N. J.

A. TYPE AB CIRCUIT BREAKERS from 15 through 800 amps. Compact... positive protection... quick-make, quick-break operation... thermal-magnetic trip.

B. QMQB FUSIBLE SWITCH UNITS from 30 through 1200 amps. Heavy duty construction... quick-make, quick-break operation... visible blades... front operation.

C. MAGNETIC OR MANUAL MOTOR STARTERS in NEMA sizes 0 through 5. Pushbuttons, pilot lights, and accessories may be added as required.

FPE

FEDERAL PACIFIC ELECTRIC COMPANY

The Best in Electrical Distribution and Control Equipment.

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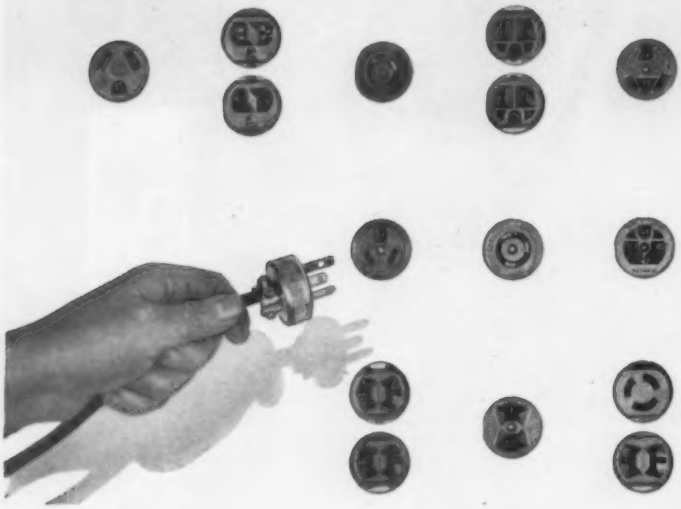
INDIVIDUAL PROTECTION STATIONS



SAFELETS

now available with a wide variety of receptacles and circuit breaker ratings

The Heinemann Safelet is a compact unit that neatly combines circuit-breaker safety with plug-in convenience. It has hundreds of applications, can be used for the individual protection of power tools, fractional horsepower motors and almost all general appliances.

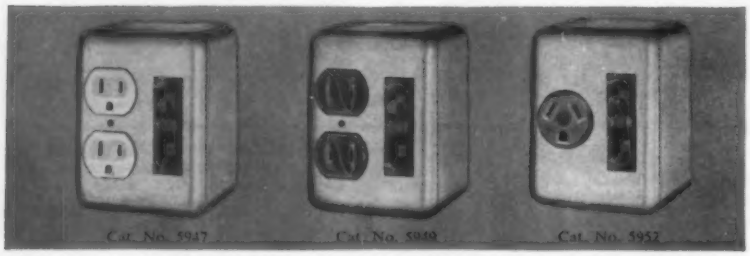
Now you can have the Safelet with any of a large number of receptacles, single and duplex, in twist-lock, polarized, "T" slot and other styles.

And now you can have a wide choice of circuit breaker ratings: from 6 to 50 amperes, at the most commonly used a-c and d-c voltages.

The Safelet enclosure is made of 16-gauge steel with an attractive grey hammertone finish. Units are available for either flush or surface mounting.

Of course, the circuit breakers used are Heinemann breakers . . . long accepted by the electrical industry as the standard of performance.

For full details, send for Bulletin 1000.



HEINEMANN
ELECTRIC COMPANY
128 Plum Street Trenton 2, N. J.

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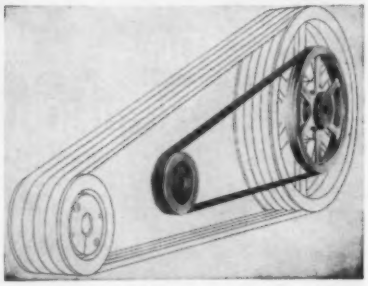
NEW PRODUCTS

(Begins on page 138)

the system in two sizes of heaters, which can be gas- or oil-fired. The larger unit will measure only 7-by-2-by-7 ft. and, like the smaller one, will require no brickwork in its installation. The R. C. Mahon Co.

28—MULTIPLE V-BELT DRIVES offer cost, size reductions

Super HC Belt Drives are announced as incorporating a "four dimensional" design advance resulting in: reduction in width of belts and sheaves; reduction in sheave diameters; reduction in center distances, and—of most importance—reduction in overall costs of the drive. According to manufacturer, the Super HC V-Belt makes it possible to reduce the cost of a drive as much as 20 per cent—and



this does not include saving realized on the use of smaller housings, bases and other components. The new V-belt covers the entire range of drive requirements with only three cross-sections, instead of five formerly necessary. And high-performance materials provide such additional horsepower capacity the cross-section dimensions can be made nearly 50 per cent smaller.

The arched top of the V-belt serves to prevent distortion of the tensile section, permitting each of the tensile cords to carry its part of the load; improved concave sidewalls prevent concentrated wear on the sides of the belt. It is pointed out that with narrower sheaves, this drive design packs up to three times the horsepower capacity in the same space. The Gates Rubber Co.

29—APPARATUS provides prepared compressed air

This method of providing compressed air dried, cooled and cleaned for use with instruments or controls and for processes where required, uses two of company's air machines in series—an after cooler and compressed air

and STEELFLEX are Registered Trademarks

Cut disconnect-reconnect time by as much as 50%

The FALK Spacer Coupling is specially designed for quick installation or removal *without disturbing the driving or driven unit.* This feature can save you up to 50% in disconnect-reconnect time when critical equipment—a process pump, for example—needs repair or replacement.

Here's another saving: with the FALK Spacer Coupling, you can quickly realign shafts *without the usual loss of operating temperature!*

And still another: you can remove or reinstall the FALK Spacer as a unit *without draining the lubricant.*

Because of its exclusive grid-groove Steelflex design, the FALK Spacer can accommodate residual misalignment—parallel, angular, or (most important) *both.* Also, it provides torsional resiliency that cushions shock and vibration. Thus it saves wear-and-tear on your connected equipment.

To prove these claims and enjoy these savings, install a FALK Spacer on one application—and see for yourself. Consult your FALK Representative or Authorized Distributor.

THE FALK CORPORATION, MILWAUKEE 1, WISCONSIN
MANUFACTURERS OF QUALITY GEAR DRIVES AND FLEXIBLE SHAFT COUPLINGS
Representatives and Distributors in many principal cities.

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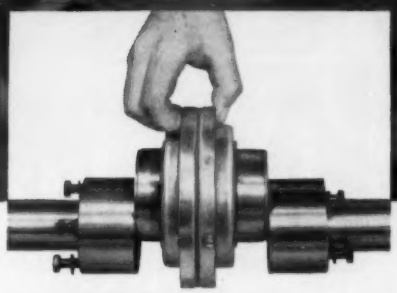
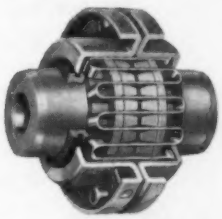


EASY AND QUICK TO INSTALL, DISCONNECT OR RECONNECT

First, mount shaft hubs to allow proper distance between hubs; then, align driving and driven units.

Second, compress Spacer to fit space between hubs and tighten cap screws to pull spacer hubs into the registered fit.

To disconnect, reverse the second step. No draining of lubricant necessary.



The heart of the FALK Spacer ...the basic Type F Steelflex
Write for Service Manual 4838

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There's more than meets the eye in a brass tacks approach to the problem of the best and most economical glazing medium you can use. Before you decide on any material for windows, skylights, partitions or other openings, remember that glass and glass alone gives you the proven performance you need for better daylighting at lowest cost. Write today for catalog 59-1, containing data on translucent, light diffusing glass. Address Dept. 13.

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- It is non-combustible . . . won't burn
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- It resists chemicals, acids, solvents, etc.
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NEW PRODUCTS

(Begins on page 138)

chiller. In the first stage, the Aero After Cooler receives hot air from compressor and cools it to approximately atmospheric temperature by evaporative cooling. At this point an oil separator removes moisture and oil or dirt that has been condensed from the compressed air. In the second stage, the air chiller uses refrigeration to cool and further dry the air. Niagara Blower Co.

30—BARREL HANDLER attaches to fork lifts

When attached to a fork lift truck, this unit can lift four 55-gal steel drums, each weighing 490 lb, manufacturer states. The unit's source of

power is an hydraulic motor-driven vacuum pump designed to operate in conjunction with the regular hydraulic system of the truck. Each unit has a dashboard panel control which allows the operator to lift or release one to four barrels collectively, individually, or in any combination. When the vacuum pad grips the barrel, a green light shows on the control panel and indicates that barrel is ready for lifting and moving. Vac-U-Lift Co.

More information on any of these products can be yours without cost or obligation. Just circle the item numbers on the Readers Service Cards provided on page 181-182.

31—STAINLESS STEEL with heat, corrosion resistance

Armco 22-4-9 Stainless Steel is available as forging billets and rounds from ⅜ to 3 in. From the standpoints of economy and strategic element content, the low nickel content (3 to 5 per cent) is said to be an important feature of this alloy. Yet, it

is reported to remain austenitic in all conditions. Armco 22-4-9 is claimed to fulfill the need for a strong, hard, erosion-and oxidation- and corrosion-resistant material for service at temperatures of 900 to 1600 F in many applications—as in high-temperature steam valves. At room temperature, this stainless steel is said to exhibit a controlled hardness between Brinell 300 and 550, depending on method of processing. Manufacturer notes that being austenitic, and due to its composition and heat treatment, this alloy maintains a relatively high degree of hardness and strength at elevated temperatures; it is also nonmagnetic. Armco Steel Corp.

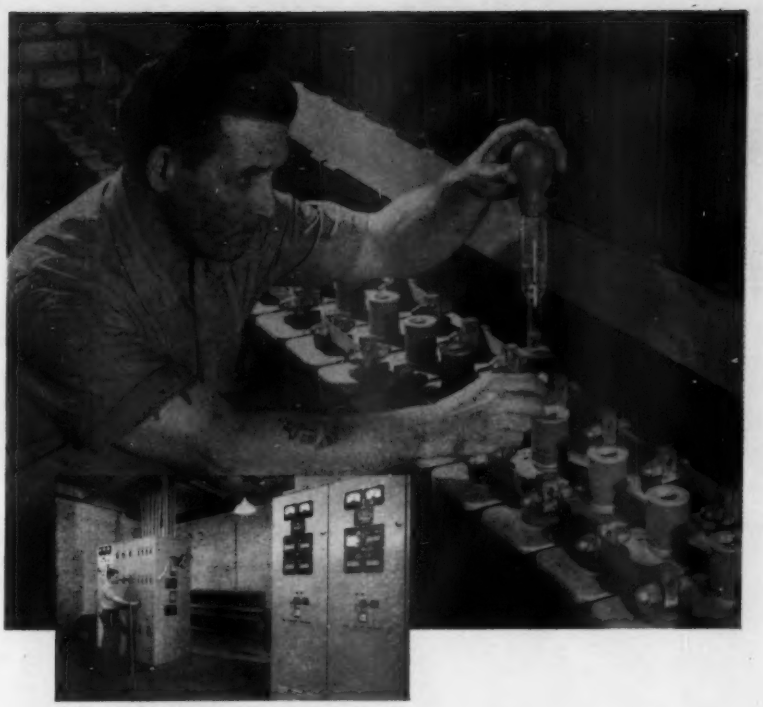
32—CONDUCTOR SYSTEMS for heavy-duty use

These 1000-amp Hevi-Bar Conductor Systems are reported to meet all straight-run mobile electrical requirements and be particularly suited to steel mills, cranes, shipyard gantrys and similar heavy duty applications Hevi-Bar can be installed as an open (bare conductor) system, or as an enclosed (safety) system. Similar in principle to company's lower amperage systems, Hevi-Bar consists of

three basic components: aluminum conductor bars, sliding shoe trolley collectors, and hanger clamps. When used as a safety system, the conductor bars are enclosed in PVC covers. Contact surfaces of the alumium conductors are clad with a hard, high-melting-point material said to give permanent protection against oxidation and arcing. Systems can be engineered on the job by regular plant mechanics, according to manufacturer. Catalog 5-58 gives further details. Insul-8-Corp.

33—WATER REPELLENT protects masonry surfaces

770 Water Repellent can be diluted with plain mineral spirits and is said to be as clear as water and as effective on mortar as it is on brick, concrete or other masonry. According to



Only infrequent checks are required for this PlastiCal® control battery installed in the switchroom of the Bridesburg plant of Rohm & Haas, Philadelphia. C&D 60-PCL-11 lead-calcium battery provides instantaneous and dependable power for operating high-voltage circuit breakers shown at right.

Less watering, less charging, 25-year life . . .

. . . sells Rohm & Haas on PlastiCal® battery for quarter-century of dependable switchgear control

No watering in more than a year. Only ⅕th to ⅒th the charging current needed. And a life-expectancy of another twenty-four years! All these outstanding advantages—together with competitive price—make this C & D PlastiCal® switchgear control battery at Rohm & Haas an investment in plant security which continues to pay off for this important chemical manufacturer.

PlastiCal, the advanced-type battery with *lead-calcium* plates, is specifically engineered for control, switchgear, and auxiliary power applications. Compared with conventional lead-antimony plate batteries, PlastiCal will go on and on in full-float service—*for a quarter-century*. "Antimony poisoning" is eliminated. High capacity and high "one-minute rate" guarantee an instantaneous surge of power to open and close critical high-voltage circuit breakers *without fail.*

Add the convenience of the clear plastic, shock-proof case, Saftee-Vent funnel, and other C & D features—and here's a control battery you'll find can't be beat. *For details, write for Bulletin CP-540.*

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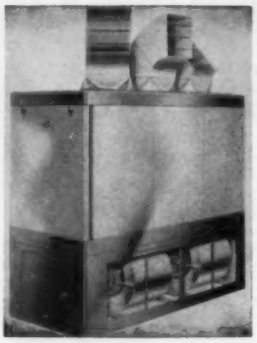
NEW PRODUCTS

(Begins on page 138)

manufacturer, water resistance is expected to last over 5 years. As shipped (33 per cent solids), the color of 770 Water Repellent is less than 120 on the APHA scale, it is noted, and at 10 per cent solids its color is less than 50. Dow Corning Corp.

34—HEATERS for unit use or central application

Available in output ranges of 280,000 Btuh and higher, with oil, gas or combination fuel burners, the OG series of industrial heaters features an integrated burner design with dual-fuel burner. For combinations, gas and oil are introduced at different



points in the same firing assembly—with changeover by a single switch. The combination air blower and individual draft blower are mounted on a single shaft and driven by a single motor. Units are built in two sections; blower or furnace sections can be used individually. Blowers are reported capable of high air deliveries at low sound levels. Heavy gage stainless steel is used in the cylindrical primary heat exchanger, aluminized steel in secondary heating surfaces. There are no internal baffles. Floor, inverted, and horizontal models are available. Air diffusion nozzles can be turned for desired air direction, or unit can be adapted for duct distribution. Lennox Industries Inc.

35—SWITCHBOARD SHELTER is easily enlarged

For outdoor switchboards, this shelter's design consists of a basic unit with outside door at each end. As additional units are added, end trim is replaced on the last unit. Hence, for each integral section of switchboard, only two outside doors are required. According to manufacturer, this arrangement meets safety code require-

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One slip can cost more than USS Multigrip"

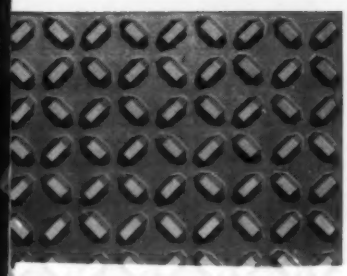
Men who work in slippery places . . . push heavy loads . . . or merely walk up and down stairs know what it means to have sure traction underfoot.

They can't wear shoes with cleats, but you can give them a floor with cleats—USS* Multigrip. Dozens of little studs provide maximum skid resistance in any direction. They are flat on top, easy to walk on—but do not catch the shoe.

Whether a landlubber or a seafarer, Multigrip assures you the same fine service. Wet or dry, Multigrip supplies safety plus.

For locations that take a heavy beating from traffic, Multigrip provides a floor that will stand up under years of constant use. Oil won't soak in and can be easily removed with regular cleaning materials. You save money by having a floor that is easy to sweep or flush clean, lasts for years with no maintenance.

On your next inspection trip, look around for danger spots—and make them safe with Multigrip*. You can get it from our local distributor.



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*TRADEMARK

NEW PRODUCTS

(Begins on page 138)

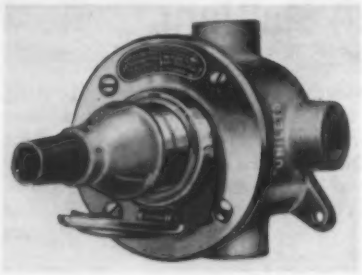
ments and minimizes the number of weatherproof outside doors required. Inside, switchboards are located on each side of a center aisle. Switchboard equipment is mounted on inside doors, which swing into the aisle to allow access to the rear of switchboard. Heaters, spun-glass filters, and fluorescent lighting are provided, also crashproof hardware—even if locked from outside, a push on a release bar unlatches door from inside. Westinghouse Electric Corp.

36—LEVEL CONTROL is line pressure operated

For liquid level control, these sliding gate and plate regulators are designed to give tight shut-off and accurate control from 1 to 2300 gpm capacity. Pressure and temperature ratings are: bronze, ¼ through 2 in., 250 psi, 406 F; and cast iron, 4 through 6 in., 125 psi, 450 F. The system uses ¼-in. needle valve and line pressure to pilot main diaphragm control valve. Bulletin J-170 gives details. Jordan Industrial Sales Div., OPW Corp.

37—RECEPTACLE protects against vapors, fumes

CPSH Series of explosion-proof receptacles for flush wall mounting have a dead-end contact feature. Any arcing is confined within a plug combination chamber of the dead-end receptacle, it is noted, and dual protection is afforded by elimination of live contacts exposed to the atmosphere, which may contain volatile, inflammable fumes or explosive vapors. A simple, one-handed operation is all that's required to complete circuit between receptacle and plug. No mechanical interlocks are used to permit insertion or removal of plug. The plug is seated by inserting as far as it will go and turning a quarter turn to the right. The circuit is broken by reversing this procedure. These receptacles are available with or without adjustable sleeve to accommodate varying wall thicknesses and include Unilet and close-up plug. Receptacles have spring-lift cover. Conduit hub sizes range from ¾ to 1 in. for Phase 1, two-wire, three-pole circuit and for Phase 3, three-wire four-pole. Appleton Electric Co.

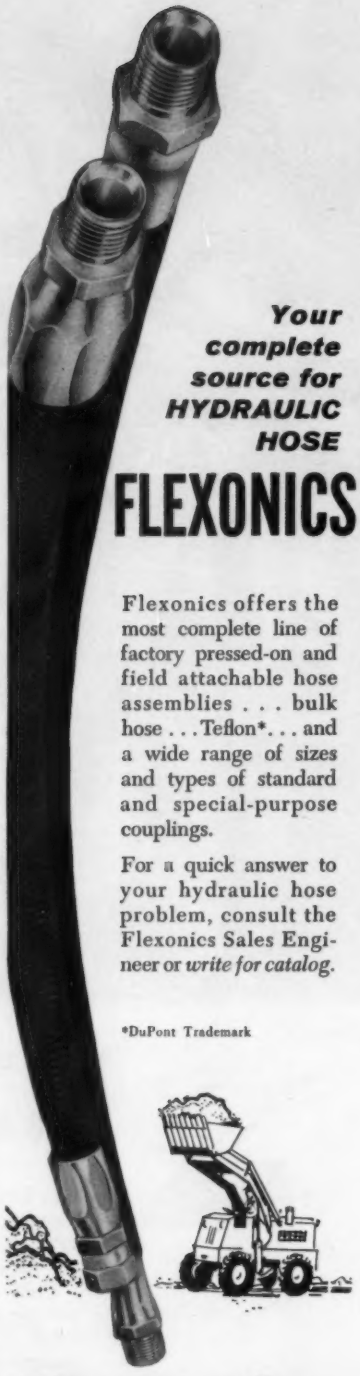


38—GANTRY A-FRAME easy to put up, store

Knock-down type gantry A-frames in the Budget line come in 1- and 2-ton capacities, each unit in a compact shipping carton, only 8-by-11-by-120 in. for easy carrying and storage. Manufacturer says that two men can assemble and erect either model in less than 1 hr. When equipped with a hoisting unit, these A-frames make a sturdy, mobile lifting device for handling loads up to rated capacity. The floor is their track, it is pointed out, and they can be used wherever lifting service is required. Gantry legs are steel tubing, bolted at the top to structural steel channels which can be assembled to produce either a top running or underhung type of installation. The 1-ton model requires 6-in. by 12.5-lb I-beams; the 2-ton model uses 8-in. by 18.4-lb I-beams. Beam on all models can vary in length but not exceed 12½ ft. I-beam can be purchased with the unit, if desired. Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc.

39—TRUCK WHEELS with longer wearing tread

Duralast, the tread material used on these wheels, is a synthetic urethane elastomer said to outlast rubber up to five times. According to manufacturer, casters and wheels with Duralast treads combine the long tread life and heavy load-carrying capacities of metal and plastic wheels with the noiseless and floor-protective qualities of conventional rubber. In addition to easy rolling characteristics, the tread is said to be hard and abrasion resistant without sacrificing elasticity or resilience. It is described as



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FLEXONICS CORPORATION • 1340 SOUTH THIRD AVENUE • MAYWOOD, ILLINOIS

Divisions
INDUSTRIAL HOSE • EXPANSION JOINT • BELLOWS • AERONAUTICAL • AUTOMOTIVE
Flexonics Research Laboratories, Elgin, Illinois
In Canada: Flexonics Corporation of Canada, Limited, Brampton, Ontario

For more facts circle 594 on Reply Card

SURVEY REPORTS SKIN DISEASE IS INDUSTRY'S NO. 1 HYGIENE PROBLEM

Here's What To Do About It In Your Plant

Recently, 2,177 major plants were surveyed by a market analyst to discover their No. 1 skin hygiene problem. The overwhelming majority of replies said: SKIN DISEASE.

The reasons for this answer:

—skin disease means costly medical treatment
—skin disease means prolonged absenteeism
—skin disease means worker dissatisfaction and compensation claims

What can you do in your plant to fight this problem? Call in an SBS skin cleanser representative. Most skin disease troubles can be traced to improper cleaning or use of the wrong cleaners. Your SBS representative is the man most completely equipped to study the situation and offer measures to improve it. He'll check all the conditions in your plant and recommend . . . not just a soap, but a *planned corrective skin hygiene program* for safe skin cleansing. Because Sugar Beet Products produces a *complete range of cleansers*, the SBS man can recommend the *exact ones* for your needs. Many famous firms are protected by SBS skin cleanser programs. Why not write us today? Dept. 58-B3.

the washword of industry

SBS sugar beet products co.

SAGINAW, MICH. • Los Angeles, Calif. • Newark, N.J
CANADA: Chemical By-Products, Ltd., Toronto, Ontario

For more facts circle 595 on Reply Card

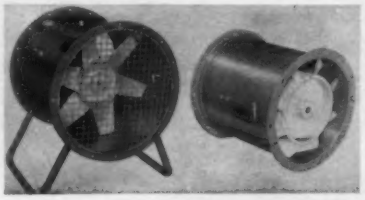
NEW PRODUCTS

(Begins on page 138)

chemically inert, non-marking, non-conductive and resistant to oil, water, grease, brine, most industrial solvents. Recommended temperature range is —40 to 200 F. Wheels with Duralast treads are available with straight or tapered roller bearings. Hamilton Caster & Mfg. Co.

40—TUBEAXIAL FANS for general and special use

Supplementing manufacturer's special designs, these pressure type tubeaxial fans have matched design motors and propellers and are available with propeller diameters of 8 to 24 in. Designated Propellair Type DT, the fans are introduced for handling air, fumes and light dusts generally encountered



in industrial or in special machining operations. Propellers are cast of tough magnesium-aluminum spark-proof alloy. Capacities range from 200 to 12,000 cfm from free air to 5 in. static pressure.

Totally-enclosed, "all-weather" motors power the fans. Single or polyphase motors come in standard voltages; high temperature Class B and explosion-proof motors are also available. Fan bodies are compact tubeaxial drums of heavy gage steel. Sizes above 8 in. have mounting flanges. Optional extras include wire mesh guards, legs, venturi inlets. Where contaminated exhaust requires that motors be outside of the air stream, belt-driven models are available. Propellair Div., Robbins & Myers, Inc.

41—WALL SYSTEM with "built-in" sun control

Thinlite is announced as a prefabricated curtain wall system enabling construction of buildings that "control" the sun. A panel system, it incorporates all structural members and basic sun-controlling glass tile to enclose a building. Built-in prisms in the 2-in. thick, hollow glass tile control the sun by rejecting solar heat during critical sun positions, it is explained, while at the same time transmitting cool, ground-reflected daylight. This is said to make air condi-

You can control hot water temperatures automatically–economically

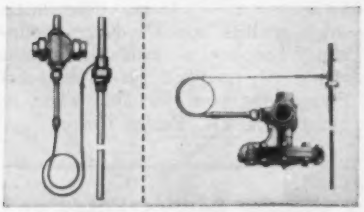
By John W. Ritter, Test Engineer
SARCO Company, Inc.

A dependable supply of hot water at exactly the right temperature for employee comfort is just as important a task for the plant engineer as providing properly heated water for process requirements. Fortunately, accurate, reliable regulation of water temperature is easy to achieve *economically* through the use of properly selected temperature controls.

It's impossible to maintain constant supervision of the delivered temperature of hot water with manual controls. Accommodating fluctuating loads that vary all the way from zero to peak requires automatic temperature regulation, controls that stay on the job all day long.

What to look for:

Automatic regulators are not difficult to select if you bear in mind the degree of control you require. You need reliability within a fairly constant predetermined temperature range – anything more than the *simplest mechanism to do this job is a waste of money.*

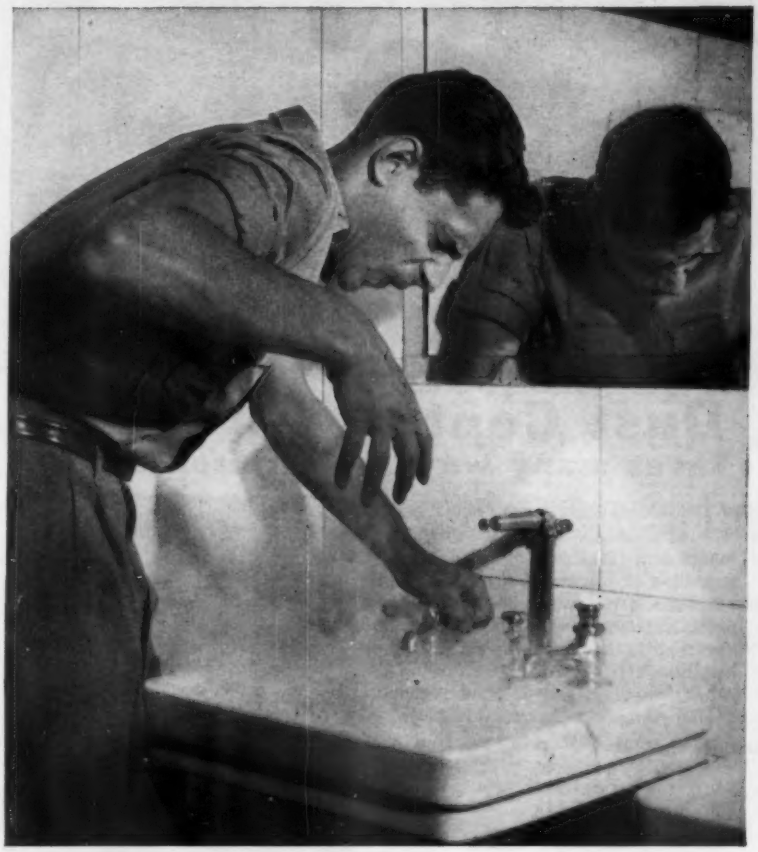


Sarco Type 50-21 Self-Powered Temperature Regulator

Sarco Type 24-30 Self-Powered Pilot Operated Temperature Regulator

First cost is important, naturally; but it is also well to examine very carefully the cost of installing or maintaining a temperature regulator. A pipe fitter should be able to do the job. When all these criteria are applied to regulator selection, the logical choice narrows to a self-operated type like the Sarco 24-30 pilot-operated model or the fully-modulating 50-21. Both of these regulators operate by powerful self-contained hydraulic systems that provide smooth operation with even increments over their full temperature range.

Both Sarco self-operated types give you automatic temperature control without high cost. The result: hot water constantly supplied at the required temperature regardless of fluctuations in supply or demand.



End erratic hot water temperature... with SARCO Self-Powered Controllers

You'll find Sarco Self-Powered Temperature Controllers regulating water temperature in scores of industries. And because these Sarco Temperature Regulators require no electricity, compressed air, or any external power supply, because they're the simplest automatic controls made, they can be kept in first-class working order by the regular maintenance staff – without special training. There are no glands or stuffing boxes, nothing to get out of order. And Sarco Regulators are inexpensive to buy, easy to install.

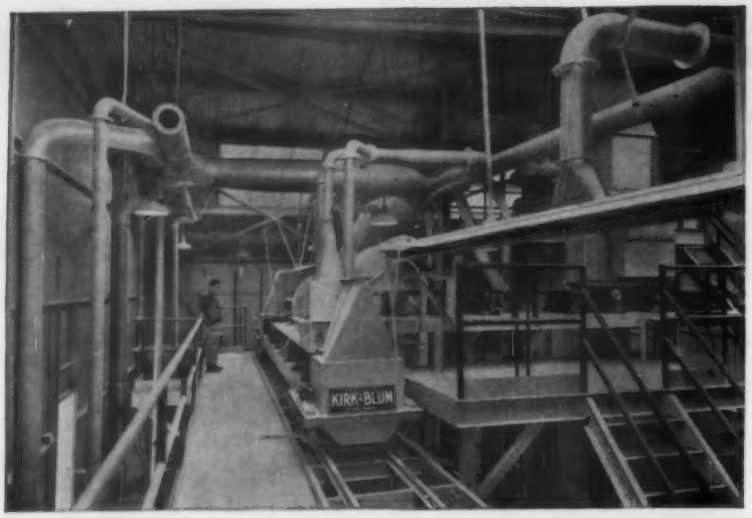
Write today for Bulletin 620, on Sarco self-powered temperature regulators.

6929-B

SARCO
COMPANY, INC.
635 Madison Avenue, New York 22, N. Y.

STEAM TRAPS • TEMPERATURE CONTROLLERS • STRAINERS • HEATING SPECIALTIES

For more facts circle 596 on Reply Card



Every "trouble point" is protected by efficiently designed hoods and ducts.

Dust Control
saves many ways at Harbison-Walker

THOROUGH ENGINEERING of a complete dust control system for Harbison-Walker Refactories Co.'s new plant at Leslie, Maryland has resulted in operating efficiencies and other benefits well worth the time and energy required.

The installation has provided (1) dust-free plant air, (2) better operating efficiency, (3) recovery of valuable silica dust, (4) lower plant maintenance and cleaning costs, (5) better working conditions, and (6) no outside air pollution.

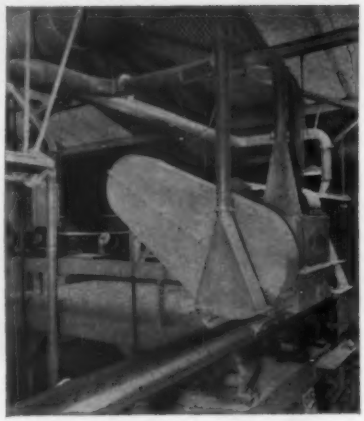
Plant-wide system keeps air clean

At every point where there is danger of dust being created or escaping into the plant, modern streamlined hoods and ducts are provided, all connected to a central system, powered by a 50 HP motor, capable of handling 25,000 CFM.

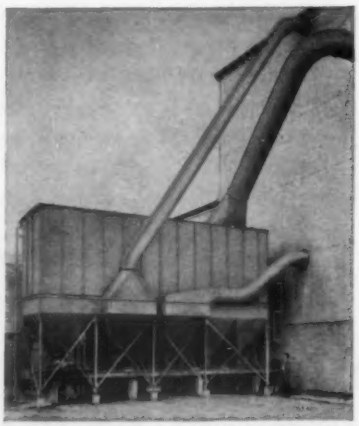
Hoods and ducts are placed out of the working area. The system collects air containing silica dust created in the processing of raw silica rock, draws it to a filter, cleans the air, and returns the collected material to bins as a product component.

Waste is eliminated and plant working conditions are kept at a level assuring greater worker productivity.

The complete installation was designed, fabricated and installed by The Kirk & Blum Manufacturing Company, Cincinnati. Information concerning Kirk & Blum Dust Collection Systems may be secured by writing to the company at 3189 Forrer Street, Cincinnati 9, Ohio.



Hoods and ducts are located so as not to interfere with working areas. Keeping plant air clean safeguards workers.



Dust laden air is cleaned in this Multibag filter. Recovered silica dust is returned to mixers for re-use.

For more facts circle 597 on Reply Card

NEW PRODUCTS

(Begins on page 138)

tioning more economical while providing cold weather insulation.

Thinlite glass tile comes in aluminum-framed 2-by-4 or 2-by-5 ft. panels to be installed at job site by fastening them to vertical aluminum struts and interlocking them with a screwdriver. Weather protection is provided by double-gasketing the entire system with both hard and soft Neoprene. Basic glass panels come in light green, rice paper white and golden yellow. Spandrel panels can be had in porcelain enamel and in ceramic-face glass in a range of colors. Kimble Glass Co.

42—DESIGN TEMPLATES save drafting time

This package of over 14 design tracing templates can be used for breadboard layouts, prototypes, design production, technical sketching and detail part drawings. To assist with development of specific mechanical systems, they cover numerous basic mechanical components, such as gears, dials, cams, differentials, shafts, pullies, speed reducers, couplings. The set is available without charge to qualified plant engineers. Please give your job title when requesting it. PIC Design Corp.

Reader Service Cards on pages 181-182 make it easy to get further information on any of these products. Just circle the item numbers of the products you would like to know more about.

43—ELECTRODE for welding of manganese steels

Mangjet is introduced to reduce the cost and provide easier operation in welding 12 to 14 percent manganese steels. This electrode is reported suitable for building up manganese steel hardsurfacing deposits on either manganese or carbon steels and also for making sound joints between two manganese steel parts or between manganese and carbon steel parts. Mangjet is described as a low hydrogen, iron powder electrode having high deposit rates, smooth beads and steady arc. It is used with both a-c and d-c welding machines. Available in 5/32-, 3/16- and ¼-in. sizes, these electrodes are claimed to deposit about

For more facts circle 598 on Reply Card

New ALLEN-BRADLEY OILTIGHT PRESSURE SWITCHES

Bulletin 836 Type T

Both operating pressure and differential are adjustable on these new A-B oiltight pressure switches. Operating pressure is externally adjustable, and setting shows on calibrated scale. A trip indicator shows operating point.

For machine tool hydraulic systems—operating at pressures up to 5,000 psi

Especially designed for heavy duty industrial applications, these new Allen-Bradley oiltight high pressure switches assure long, trouble free life. The attractive die-cast aluminum enclosure is completely sealed to exclude oil and water. The snap-action switch mechanism maintains its high contact pressure to the point of switchover—no matter how slowly it is approached. Contact chatter is eliminated—trouble free contact life is increased. The contact block has two isolated circuits with one N.O. and one N.C. set of contacts.

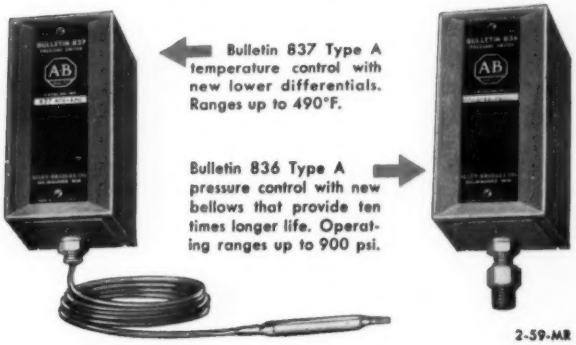
Send for complete information on this newest addition to Allen-Bradley's wide line of *quality* pilot controls.

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

ALLEN-BRADLEY
MOTOR CONTROL
QUALITY

Internal view of piston design used on units for systems above 500 psi. Bellows type construction is used up to 500 psi.

Also...A New Line of Pressure and Temperature Controls with Lower Differentials



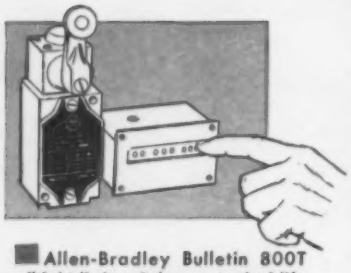
Bulletin 837 Type A temperature control with new lower differentials. Ranges up to 490°F.

Bulletin 836 Type A pressure control with new bellows that provide ten times longer life. Operating ranges up to 900 psi.

2-59-MR

Allen-Bradley is not satisfied until Limit Switch Life runs into

MANY MILLIONS OF OPERATIONS



Allen-Bradley Bulletin 800T oiltight limit switches on typical life tests have run many millions of operations. Write for complete information on the Allen-Bradley line of quality limit switches for every industrial application.

Here are some new—and some old—Allen-Bradley oiltight limit switches—all built to give you extra millions of trouble free operations. Their switch bodies and operating heads are both sealed. Oil, dirt, and metal chips cannot enter and foul the contacts or cause sluggish operation of the momentary contact mechanism. Double break, silver alloy contacts never need maintenance. The snap action switch is positive insurance against any reduction of the contact pressure as the "trip point" is approached. This means less chance for chatter and arcing of relays, contactors, or starters operated by the limit switch—and prolonged trouble free contact life for the limit switch itself.

The Allen-Bradley line of limit switches is complete. Illustrated are only a few variations.

Side Push Rod

Adjustable Rod

Top Push Rod with Plastic Window

Adjustable Roller Lever

Roller Lever for Flush Mounting

Wobble Stick Type

Neutral Position Momentary Contact Limit Switch. One set of contacts is closed for each direction of operation.

Fork Lever Type

Side Push Roller

Roller Lever for Manifold Mounting

Side Push Rod Maintained Contact

2-59-MR

ALLEN-BRADLEY

MOTOR CONTROL

QUALITY

Allen-Bradley Co., 1316 S. Second St., Milwaukee 4, Wis.
In Canada: Allen-Bradley Canada Ltd., Galt, Ont.

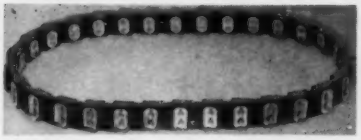
NEW PRODUCTS

(Begins on page 138)

twice as much weld metal per electrode as many non-iron powder electrodes. Each ¼ in. electrode covers 9 sq in with a deposit ⅛ in. thick, says company. Mangjet deposits are 12 to 14 per cent manganese steel with copper and molybdenum for additional strength and toughness. Their wear resistance is reported comparable to heat-treated cast manganese steel. The Lincoln Electric Co.

44—VARIABLE SPEED BELT adjusts to any length

According to manufacturer, the MVS Belt does not require dismantling of machinery for installation and is precision balanced to eliminate vibration.



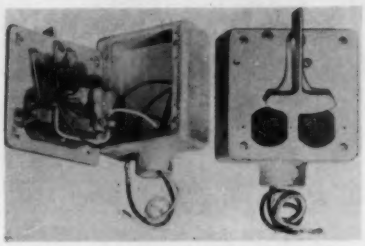
It is made of oil- and heat-resistant Neoprene. Available in a wide range of sizes, the new belt is a link design adjustable to any length for use on various size drives—with few exceptions it will serve as a replacement for all uses, says manufacturer. Manheim Mfg. and Belting Co.

45—PIPE HEATING UNIT replaces heat loss

This unit is designed to replace heat lost during the transfer of liquids through pipes up to 3-in. diam. It is reported particularly useful where molten lead is transferred, as well as for restoring heat loss of asphalt, sodium and other materials in liquid form. The pre-fabricated pipe-heating unit consists of a formed, steel-sheathed tubular heater rated 600 w, 120 or 240 v, and is mounted on an aluminized reflector 3 ft long. Insulated with calcium-silicate, the reflector is covered by an outer coating of sheet metal. A bimetallic thermostat is mounted between the tubular heater legs and wired in series with the unit. Thermostat range is 0 to 650 F. General Electric Co.

46—RECEPTACLES for use in hazardous places

Used like ordinary wall plugs, these non-sparking economical wall-mounted interlock receptacles are designed to permit using any cord set safely in hazardous locations as defined in Na-



tional Electrical Code. Company says the plug can be inserted and locked into the receptacle with no danger of sparking, and a safety cam lever locks the plug in place. The locking cam operates a tilting mercury bottle switch which prevents insertion or removal of plug while current is on. The stainless steel Durakool plastic bottles act as hermetically sealed circuit breakers. Bottles are available with straight or twist-lock receptacles. Panellit, Inc.

47—FLOOR MACHINE is quiet, easily serviced

Model 20-E Silent Floor Machine is a 20-in. size with a new type of gear reducer—a separate unit from the motor to assure quieter operation, company announces; only finger pres-

Illustrated—Logan Model 400 RFL Unit

Look to Logan

the ultimate in air circuit accessories

Logan RFL Unit, the designers choice for over a decade! Protects your air-powered equipment . . . regulates pressure . . . filters air . . . lubricates air. Adds years of dependable performance.

New Model 400, illustrated above, is a companion model to the well-known Model 600.

FREE SEND FOR YOUR COPY OF THE LOGAN "CIRCUIT RIDER" A 32-page manual on fluid power circuits (fifth edition) completely revised to present current engineering trends.

MEMBER: Natl. Mach. Tool Builders' Assn.; Natl. Fluid Power Assn.

LOGANSPORT MACHINE CO., INC.
838 CENTER AVENUE, LOGANSPORT, INDIANA

PLEASE SEND COPY OF CATALOG:

- ☐ 100-1 AIR CYLINDERS
- ☐ 100-2 MILL-TYPE AIR CYLS.
- ☐ 100-3 AIR-DRAULIC CYLS.
- ☐ 100-4 AIR VALVES
- ☐ 100-5 LOGANSQUARE CYLINDERS
- ☐ 100-5-1 ULTRAMATION CYLINDERS
- ☐ 300-2 PRESSES
- ☐ FACTS OF LIFE
- ☐ 200-1 HYD POWER UNITS
- ☐ 200-2 ROTOCAST HYD. CYLINDERS
- ☐ 200-3 750 SERIES HYD. CYLINDERS
- ☐ 200-4 and 200-7 HYD VALVES
- ☐ 200-6 SUPER-MATIC CYLS
- ☐ 300-1 CHUCKS
- ☐ ABC BOOKLET
- ☐ CIRCUIT RIDER

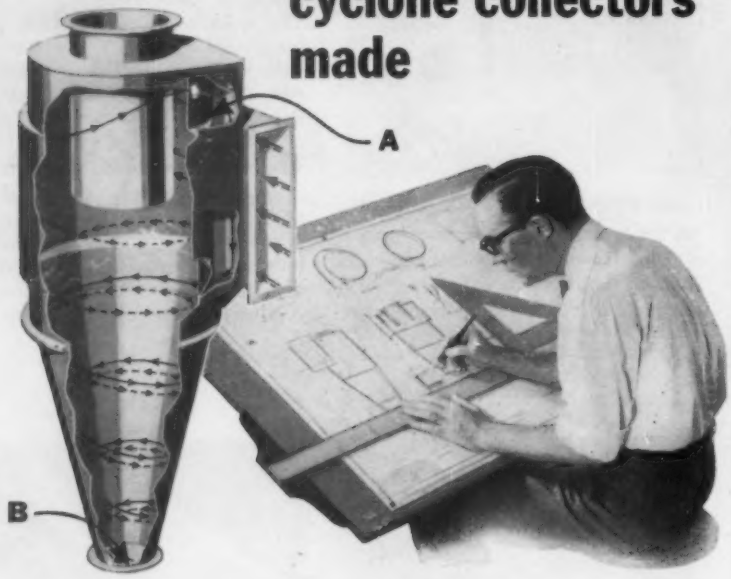
TO:

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

The most efficient operating cyclone collectors made



Design makes the difference: in over a thousand plants across the continent, Buell Cyclones have *proved* themselves more efficient than any other cyclones made. Buell's exclusive Shave-off port (A), traps the extra percentage of dust that ordinary cyclones lose. And large-diameter (B), custom-engineered design eliminates bridging, clogging, or plugging during operation, keeps efficiency high without interruption. Regardless of your present or planned plant layout, Buell equipment can be designed to solve your dust collection problems efficiently and economically. There's valuable information in a concise booklet, "The Exclusive Buell Cyclone". Write Dept. 14-B, Buell Engineering Company, Inc., 123 William Street, New York 38, N. Y.

BUELL CYCLONES

"SF" ELECTRIC PRECIPITATORS

PRECIPITATOR-CYCLONE COMBINATIONS

Buell Cyclones before installation at a major plant.

buell®

Experts at delivering Extra Efficiency in

DUST COLLECTION SYSTEMS

For more facts circle 600 on Reply Card

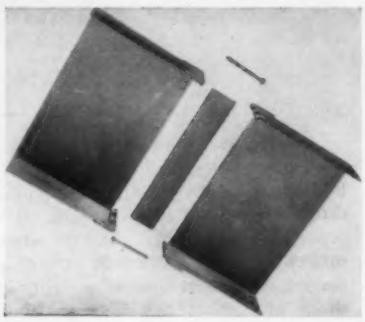
NEW PRODUCTS

(Begins on page 138)

sure is required to maneuver it. The 1-hp motor rests directly over the brush, affording uniform coverage and effective use of power. To prevent runaways, a safety switch is provided which stops the machine once the grip on the handle is released. Available with more interchangeable accessories than company's previous models, the Model 20-E is equipped with 50 ft of cable, a hair-trigger which turns the machine on and off with pressure from either hand, a brush-reversal mechanism, and optional handle adjustment. The machine is designed to polish, scrub, sand, seal, wax, steel wool and shampoo floors. Manufacturer says the gears never need lubrication and the machine will remain quiet after years of service. Equipment includes a light-colored polishing brush, brown scrubbing brush. Huntington Laboratories, Inc.

48—SUPPORT SYSTEM for control cable, tubing

Controlway is claimed to provide the lowest installed cost of any cable supporting system. It is reported especially suitable for use with control and signal cables where circuits under 600 v



are not in continuous operation and ventilation is unnecessary. Of galvanized steel, Controlway is available with or without covers, and includes a complete line of fittings. Straight sections came in 10-ft lengths, in widths of 9, 12 and 18 in. Sections and fittings join with pin-type coupler. T. J. Cope Div., Rome Cable Corp.

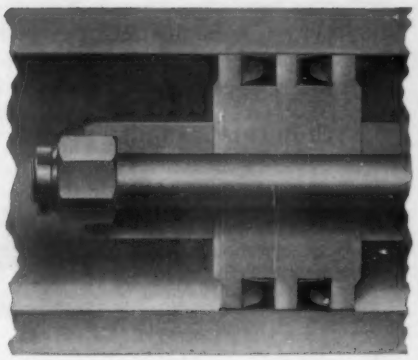
49—PATCHING MATERIAL for outdoor surfaces

Zor-X is announced as an all-weather, outdoor patching material for chuckholes, cracks and ruts in black-top, concrete, brick, stone, even cinders. Manufacturer says it can be applied in winter, even if the surface is wet or the temperature as low as 15 F,

NEW FLARED-LIP U-CUP PACKING REDUCES FRICTION

Garlock's new homogeneous U-cups are designed for minimum frictional resistance in low pressure air or hydraulic cylinder applications. They are molded of synthetic rubber with flared sidewalls which also facilitate assembly, especially when cylinder bores vary slightly in size. Instantaneous sealing after sudden pressure changes is another advantage of the flared-lip design. Sizes ½" O.D. to 3¾" O.D. are available from stock. Sizes to meet all AN6226 and JIC dimensional specifications.

Homogeneous U-cups are another part of the famous "Garlock 2,000" . . . two thousand different styles of packings, gaskets, and seals to meet all your needs. It's the only complete line . . . it's another reason you get unbiased recommendations from your Garlock representative. Call him or write for AD164.



The new Garlock 9511 U-cup Packing is recommended for pressures to 2000 psi. The flared-lip design creates an interference fit especially adaptable to applications involving sudden pressure changes. Clearance at the heel reduces friction, makes assembly easier.

THE GARLOCK PACKING COMPANY, Palmyra, N.Y.

For Prompt Service, contact one of our 30 sales offices and warehouses throughout the U.S. and Canada.

GARLOCK

Packings, Gaskets, Oil Seals, Mechanical Seals, Plastic Products, Molded and Extruded Rubber

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CONTROL AIR POLLUTION

Profit from public demand for cleaner air

FREE brochure tells you how!

Now learn how you can clean up combustible pollutants, fumes, and odors from your processes. An Oxycat System can be engineered to your special requirements.

Catalytic oxidation installations often lead to actual fuel savings. For many applications they are more economical than flame incinerators . . . more efficient than water scrubbers.

Oxycat Systems are the most effective air pollution control and waste heat recovery method ever developed. Discover how profitably they can work for you in drying ovens, furnaces, and chemical and food processes.

An economical Oxycat System can be your answer to rising public, editorial and medical demands for cleaner air and anti-pollution legislative controls on industry! Improved community relations pay off. Investigate—send today for brochure with facts and figures on typical installations!

STOP DEADLY EXHAUST FUMES

Oxy-Catalyst also manufactures an economical exhaust purifier to stop engine fumes from all type fuels. For use on fork trucks, stationary engines, power sweepers, all automotive equipment used in confined areas! Send for free brochure with full facts.

OXY-CATALYST, INC. Wayne 3, Pa., U.S.A.

Catalysts for fume and odor elimination, air pollution control, and waste heat recovery

Please send me your free brochure(s) on:

☐ Oxycat Systems to control air pollution, recover waste heat

☐ Oxy-Catalyst Exhaust Purifiers to stop deadly engine fumes

Name_____

Address_____

Firm_____

City_____ Zone_____ State_____

For more facts circle 602 on Reply Card

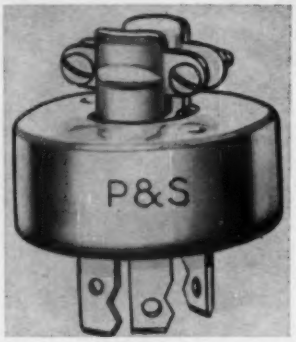
NEW PRODUCTS

(Begins on page 138)

and it sets immediately. There are two grades—one for depressions less than 2 in. deep, the other for deeper holes. You fill the depression or crack with Zor-X, then tamp it. No prime coat is necessary, says company, and the repaired areas take heavy loads right away. Zor-X comes ready to use. The Monroe Co., Inc.

50—WIRING DEVICES for polarized connections

The P&S Polarized line of matched wiring devices for locations requiring polarized connection is designed for long life and easy wiring. Receptacles are back and side wired; they have



heavy contacts, totally enclosed plastic bodies. Caps feature tapered wireways and many are completely armored (as shown) and finished to resist corrosion. Polarized devices range from 10- to 50-amp ratings. They include two-, three-and four-wire receptacles—single and duplex with and without metal box covers—and a line of caps, connector bodies, cord sets, and other wiring devices. Pass & Seymour, Inc.

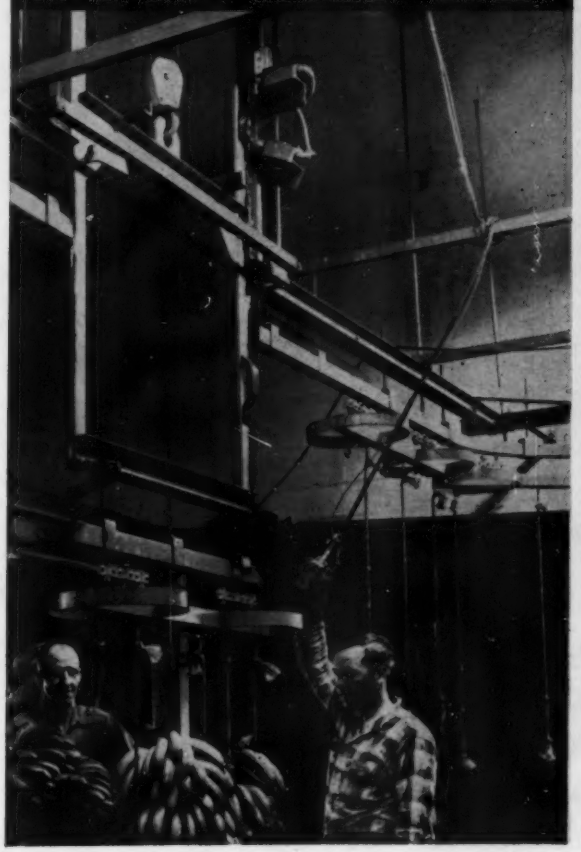
51—COOLANT GERMICIDE packs a double punch

To combat the tendency of bacterial growth in coolant solutions to develop an immunity to one form of germicide used repeatedly, Germicide 66 and 68 is based on the use of two types of germicides in alternating sequence. Switching from one to the other serves to prevent resistant strains of bacteria from developing. Use of Germicide 66 and 68 is claimed to provide continuously effective control of coolant rancidity and odor under all shop conditions. Highly concentrated and having a highly alkaline pH, Germicide 66 and 68 may be added in small amounts directly into the solution. Manufactur-

save money... install

COBURN

OVERHEAD CONVEYING SYSTEMS



- **Low initial cost**—no expensive, custom-built equipment needed because Coburn's sectionally-designed equipment can be adapted to any plant.
- **Increased labor efficiency** — reduces handling costs, speeds up spotting of work directly over machines.
- **Minimum repair costs**—Coburn's top quality materials and workmanship mean low repair and replacement costs.
- **Easy to install**—Coburn systems are so simple and functional in design that your plant personnel can install them, at substantial savings over systems that must be installed by the maker.

Coburn also makes a complete line of sliding door and fire door hardware. For further details on any Coburn product, contact the nearest sales office listed below.

Atlanta • Boston • Buffalo • Chicago • Detroit • New Orleans • New York Philadelphia 6074

CF&I COBURN PRODUCTS

PRODUCTS OF WICKWIRE SPENCER STEEL DIVISION
THE COLORADO FUEL AND IRON CORPORATION

For more facts circle 603 on Reply Card

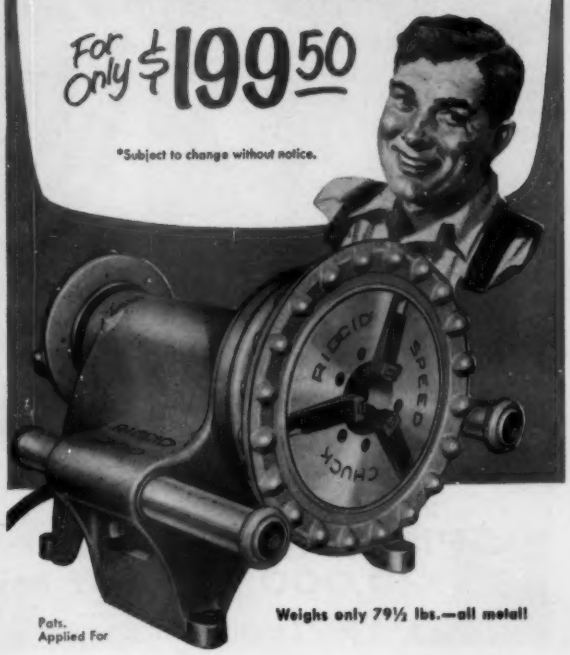
Cut and Thread Pipe by Hand?

...not me or my men when I can get the new tough fast little

RIDGID 300 Power Drive

For Only $199.50*

*Subject to change without notice.



Pats. Applied For

Weighs only 79½ lbs.—all metal!

Full Speed...even on 2" pipe or conduit

This new 300 is clear out of its price class! Its RIDGID-built motor has extra power and extra-long brush life . . . heavy-duty bump-proof switch . . . RIDGID Speed Chuck with guaranteed tight grip, forward, reverse, replaceable jaw inserts and all-metal hand wheel ...2 extra-strong tool support bars . . . and a lot of other features that make it far the most for your money. You can't afford to be without it—see and try the new 300 at your Supply House!

No. 1206 Stand for RIDGID 300 *Price $27.00

The Ridge Tool Company Elyria, Ohio, U.S.A.

THREADED PIPE... It's Tight... It's Fast... Costs Less!

For more facts circle 604 on Reply Card

Planning ahead can save $20,000 on fluid mixing

An idea from your LIGHTNIN Mixer representative's briefcase

This engineer is listening to an idea that's going to save his company $20,000 on fluid mixing.

He's working on a process that will employ mechanical mixers. But in a year or so, process requirements are expected to change, throwing 15% greater load on the mixers.

Problem: how can he anticipate this change *now?*

Solution proposed by LIGHTNIN Mixer representative: install standard turbine-type LIGHTNIN Mixers geared for the immediate job, but sized to handle the expected load.

When requirements increase, simply change impellers and two gears in each mixer—providing correct power input for the new conditions at minimum expense.

What this man can do for you

This is one example of the many ways your LIGHTNIN representative can help you get efficient fluid mixing at lowest long-term cost.

He can give you better service on fluid mixing than anyone else—because he has seen and done more of it.

Take advantage of his unmatched experience by putting him on your process-design team. For prompt help on any fluid mixing operation, call him in now. He's listed in Chemical Engineering Catalog. Or write us direct.

Lightnin® Mixers

MIXCO fluid mixing specialists

MIXING EQUIPMENT Co., Inc., 144-b Mt. Read Blvd., Rochester 11, N. Y.

In Canada: Greey Mixing Equipment, Ltd., 100 Miranda Ave., Toronto 10, Ont.

For more facts circle 605 on Reply Card

NEW PRODUCTS

(Begins on page 138)

er says ⅓ to ½ pint is sufficient to sanitize and deodorize 50 gal of coolant solution. American Charcoal Co.

52—SELF-STICKING LABEL can be use outdoors

For outdoor or permanent indoor use, the MC Labelon consists of a pressure-sensitive card that can be written or typed upon, and then covered with an attached clear layer of outdoor-type Mylar plastic for protection. The Mylar cover withstands rain, dirt and sunlight, it is pointed out, and is not affected by grease, oil or acids. The labels are reported to resist heat up to 300 F, cold to -100 F. Labels are available with borders in black, blue, red or green and come in small tray-type boxes. Labelon Tape Co., Inc.

53—POWER HAMMER delivers blow to suit job

Model H-812A, a ½-in. capacity electric hammer, weighs just 4 lb and is only 11¼ in. long, but it features adjustable blow and idling action. Hammer impact is adjustable from light to heavy, meeting a variety of

job requirements. A twist of the knurled collar near the chuck sets the force of blow and maintains it until reset. To prevent hammer vibration and increase operator safety, hammer action stops and motor idles when tool is not actually on the work. This compact hammer is reported especially useful in setting fasteners and anchoring machinery, also for removing hard-steel sash putty when replacing glazing—it is workable in overhead or close-quarter jobs. It is furnished with six rawl drills, two rawl drill chucks, and a chisel, all in a steel carrying case. The cost is around $100.00. Bulletin EH-4 gives details. Milwaukee Electric Tool Corp.

54—SPEED CHANGER for smooth, instant variations

Versatility is stressed for the Vari-Tex Speed Changers. Four-position motor mounting and two-position gear mounting make it possible to adapt a Vari-Tex to varying space conditions.

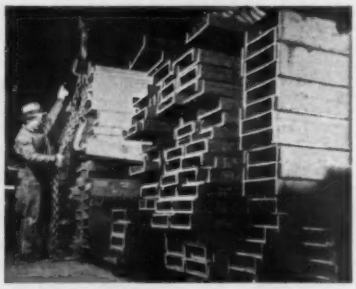
NEW PRODUCTS

NEW!

REPORT FROM RYERSON
on Services and Products in Stock

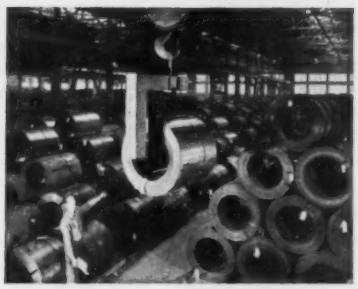
In addition to the products shown below, you can call on Ryerson for flame-cut steel shapes, fabricated steel for reinforced concrete construction—many other products and services. And equally important are the specialists who carry out the Ryerson quality control program—see that customers specifications are *exactly* met, that every order is correctly filled and promptly delivered. As a result you get unequalled service and certified quality when your company calls Ryerson for steel, aluminum, industrial plastics and machinery.

CARBON STEEL & ALLOY BARS
Most complete range of types, shapes and sizes as well as largest tonnage.

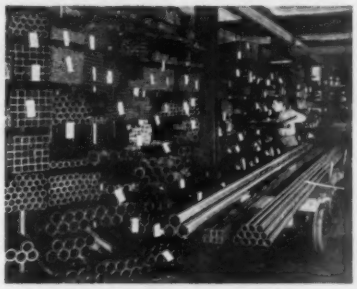


STRUCTURALS—I-beams, H-beams, channels, angles, tees and zees—all high quality steel to ASTM spec. A-7.

PLATES—14 types including special low carbon steel plates for forming and welding, leaded New E-Z-Cut, etc.

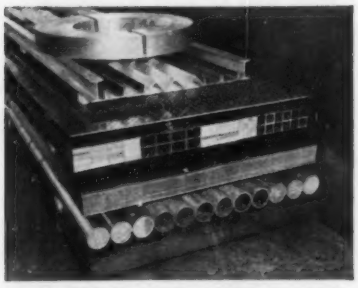


SHEET STEEL & STRIP—More than 20 different types in pattern sizes, cut-to-order sizes, strip coils, etc.



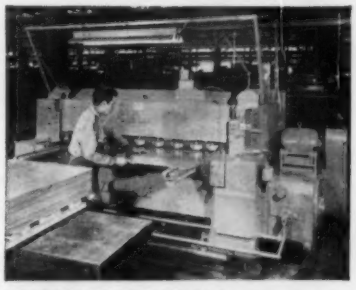
TUBING—Seamless and welded steel tubing—mechanical tubing, fluid line, pump cylinder and structural tubing.

STAINLESS STEEL—For immediate delivery. Over 2351 sizes, shapes, types, finishes: sheets, plates, bars, pipe, etc.



ALUMINUM—At many Ryerson plants—sheets, coils, plates, bars, tubing, architectural and structural shapes, etc.

INDUSTRIAL PLASTICS—PVC pipe, fittings, sheets and rods, rigid Kralastic and flexible polyethylene pipe.



MACHINERY & TOOLS—The broadest line of metal-working equipment available from a single source.

RYERSON CERTIFIED QUALITY

RYERSON STEEL®

Member of the INLAND Steel Family

Principal Products: Carbon, alloy and stainless steel — bars, structurals, plates, sheets, tubing — aluminum, industrial plastics, metalworking machinery, etc.

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • WALLINGFORD, CONN. • PHILADELPHIA • CHARLOTTE • CINCINNATI • CLEVELAND DETROIT • PITTSBURGH • BUFFALO • INDIANAPOLIS • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

For more facts circle 606 on Reply Card

How to cut scrap handling costs 50%

Here's the fastest, lowest cost method of scrap handling ever devised. Hundreds of industries are now using Roura Hoppers instead of barrels or tote boxes to collect scrap metal. They're placed alongside machines or in strategic locations. When full, lift truck operator picks up loaded hopper . . . transports it to scrap bin or freight car . . . flips the latch . . . and the hopper automatically dumps its load, rights itself, locks itself. Hopper is returned to its station and operator is free for other work.

Segregation of scrap is simple. Hoppers can be marked for copper, brass, stainless, etc. Brings higher prices.

Roura Hoppers are made in five sizes, ½ to 2 yard capacities. Sturdily built of ¼" steel plate with continuous arc-welded seams. Also available in stainless steel or galvanized. Mounted on live skids or a choice of wheels. Standard models available for immediate shipment from stock.

Start cutting costs now . . . with Roura Hoppers. *Remember . . . if it's as good as a Roura it IS a Roura.*

ROURA
Self-Dumping
HOPPER

HERE'S HOW to get more details about Roura Self-Dumping Hoppers. Just attach this coupon to your letterhead . . . sign your name . . . and mail to . . .

ROURA IRON WORKS, INC.
1413 Woodland Ave., Detroit 11, Michigan

For more facts circle 607 on Reply Card

NEW PRODUCTS

(Begins on page 138)

The one-piece motor and driver sheave shaft supported between bearings at the ends is designed to reduce shaft deflection and increase efficiency. Other features announced include low weight per horsepower, small physical size, "in service" lubrication, and large case openings for easy internal maintenance. Speed indication is provided by an easy-to-read indicator mounted adjacent to the hand wheel.

According to manufacturer, the Vari-Tex's overall electrical input to mechanical output efficiency approximates 78 per cent. Bolt hole mountings on vertical units correspond to standard NEMA dimensions. Because this speed changer is designed primarily for constant torque applications, speed ratios are dependent upon size. Four case sizes are contemplated with maximum speed ratio of 10 to 1 in the 1- to 3-hp units, and 4 to 1 in the 40- to 60-hp units. Maximum ratios of intermediate units will be 6 to 1. Allis-Chalmers Mfg. Co.

55—VACUUM PUMP obtains pure samples

Announced as providing a clean and safe method of obtaining samples, the Golden Thief is a vacuum pump which steals samples of liquids (and some powdered solids) from tanks, drums, crankcases and many inaccessible places by drawing the liquid into laboratory bottles or cans. Standard models are made to screw on bottles 1 oz to 1 gal (20 to 38 mm neck threads), and on cans from ¼ pt. to 5 gal, depending on size of pump. Air is extracted from the container on the upward stroke of the plunger and the liquid sucked or siphoned through the base of the pump, directly into the container. Material pumped does not enter the cylinder. The Golden Thief is made of all aluminum, brass or stainless steel. W & W Mfg Co.

NEW! ERIEZ HI-VI VIBRATORY FEEDERS & BIN VIBRATORS

specially constructed for
HAZARDOUS, DUSTY LOCATIONS

FULLY ACCEPTABLE BY MILL MUTUAL FIRE PREVENTION BUREAU

Only Mill Mutual Acceptable electro-permanent magnetic vibratory equipment at economical prices!

Vibratory Feeders – accurately feed and control bulk materials, from ounces to tons. Completely enclosed drive element, built-in glass fiber springs, impotted epoxy sealed electrical coil. Needs no rectifier.

Unit (Bin) Vibrators – keep hard-to-move materials flowing through bins, chutes, etc. Exclusive pinpointed vibration impact. Completely enclosed and sealed. No sliding or rotating parts to wear. No rectifier needed.

WRITE FOR BIG VIBRATORY FACT FILE
Eriez Mfg. Co., 71P Magnet Dr., Erie, Pa.

ERIEZ

For more facts circle 608 on Reply Card

Proven Maintenance Savings with Guaranteed

FILON®

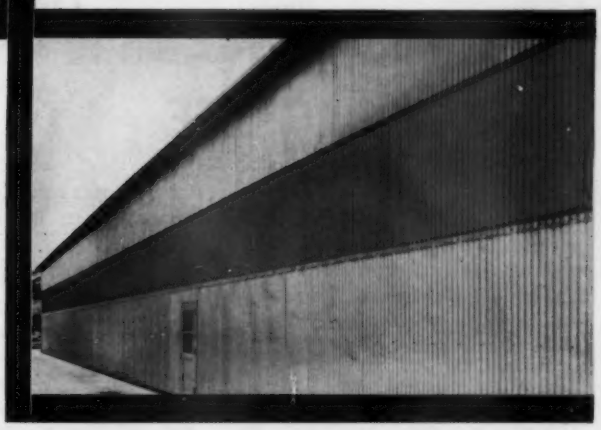
SHATTERPROOF FIBERGLASS PANELS AND GLAZING PANES

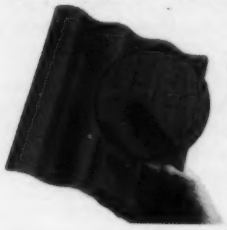
GLAZE WITH FILON—End costly window breakage with shatterproof FILON glazing panes. Combine safety with savings. FILON will not crack or splinter. Amazing impact strength! Resists breakage from flying objects, vibration, twisting, hail, sonic blast, other industrial hazards. Once in, FILON stays in. End reglazing expense once and for all.

SKYLIGHT WITH FILON—Flood your plant with free daylight. Cut artificial lighting costs to the bone. Translucent FILON gives diffused working light without glare and shadow. Boosts production efficiency by creating comfortable working light that reduces eye strain.

SIDELIGHT WITH FILON—Install FILON and watch maintenance costs tumble. FILON needs no painting. Colors are built in to last. Resists acids, fumes, corrosion. *Super-smooth* surface both sides will not accumulate dust, dirt or erosive particles.

EASY TO INSTALL—FILON building panels require no special sash or framing, nest perfectly with all standard building materials. FILON glazing panes are pre-cut to all standard sash sizes; install like glass.





ONLY FILON IS NYLON REINFORCED
The nylon strands, as shown in this magnified view, combined with Super-Fi Fiberglas, are your assurance of greater strength, superior quality and durability.

Filon-Hetron panels are available with UL Label and F.M. Approval.

Insist on the FILON label with
FILON'S EXCLUSIVE 5-WAY GUARANTEE

1. *Superior Fiberglass-and-Nylon reinforced strength*
2. *Uniform thickness for easier installation, better diffusion of light and color*
3. *Shatterproof for absolute safety*
4. *Weatherproof for maximum durability*
5. *Exceeds standards published by U. S. Bureau of Standards*

FILON TECHNICAL SERVICES DEPARTMENT
125 Lomita Street, El Segundo 30, California

- ☐ Send **FREE BOOKLET** which contains facts on FILON Skylighting, Sidelighting and Glazing Panes, complete with types, sizes and installation photos.
- ☐ Include **FREE** Glazing Data Sheet #501.
- ☐ Include **FREE** sample of #G30 Glazing Pane.

NAME_____

ADDRESS_____

CITY_____ ZONE____ STATE_____

COMPANY_____

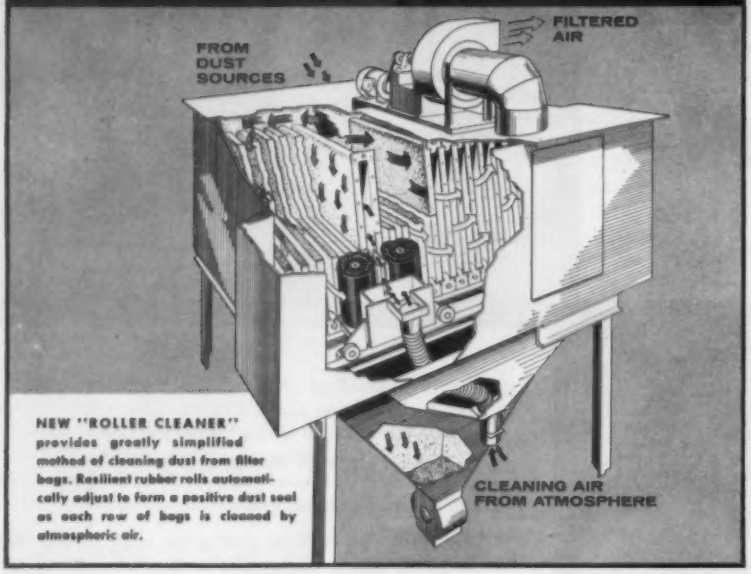
Also see Sweet's File: Plant Engineering 5b/Fi *— Industrial Construction* 6b/Fi

FILON PLASTICS CORP.

Los Angeles • New York • Chicago
Atlanta • Dallas • San Francisco • Denver

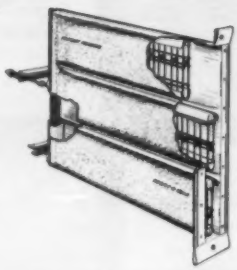
For more facts circle 609 on Reply Card

NEW SLY DYNACLONE® DUST FILTER


FROM DUST SOURCES
FILTERED AIR
NEW "ROLLER CLEANER" provides greatly simplified method of cleaning dust from filter bags. Resilient rubber rolls automatically adjust to form a positive dust seal as each row of bags is cleaned by atmospheric air.
CLEANING AIR FROM ATMOSPHERE

Patent Nos. 2583039, 2695681, 2867289. Other Patents Pending.

NOW! As Much As 3 TIMES LONGER FILTER BAG LIFE



NEW SLY "RESIST-O-WEAR" FILTER BAGS (patent pending) provide complete dust filtration with as much as three times longer life than conventional bags. This has been proved on the toughest field installations.

The new bag has three equal-size sections. Each pocket has two spacers, making a total of six per bag. Weight is distributed on three seams rather than one, minimizing strain. A special protective flap on the back end prevents abrasion from incoming dust.

Now standard in the new "Roll-Clean" Dynaclone, Sly "Resist-O-Wear" bags combine with all the other superior Dynaclone features to assure greatest dust collecting efficiency with unequalled maintenance-free service.

ALL THESE FEATURES IN ONE DUST FILTER

- New "Resist-O-Wear" bags last as much as three times longer.
- Constant suction at dust sources—complete dust collection.
- Automatically self-cleaning for continuous operation.
- Free-rolling cleaner. Complete dust seal—automatic seal adjustment.
- Greater filtering capacity; smaller space requirements.
- Simplified construction for ease of inspection and servicing.

SEND FOR New Bulletin 105 and New 36-page Dust Control Catalog 104.

SINCE 1870 SLY

THE W. W. SLY MANUFACTURING CO.

4600 TRAIN AVENUE • CLEVELAND 1, OHIO
OFFICES IN PRINCIPAL CITIES

OVERSEAS LICENSEE: ANDREW AIR CONDITIONING LTD., LONDON S.W. 1, ENGLAND

For more facts circle 610 on Reply Card

New Plant Construction

(Continued from page 130)

facility on large building site here, to consolidate the manufacturing, research and development and administrative activities of the company's six plants. New plant will have a working area of 120,000 sq ft and will be built at a cost of about $1.5 million. Work on the new plant is scheduled to get under way at once and plant will go into production early in 1960.

Rye, N. Y.—Norden Division of United Aircraft Corp., East Hartford, Conn., has acquired a 100-acre farm property which it proposes to use as a building site for new 350,000-sq ft plant for the manufacture of company products. Go ahead plans for this multi-million dollar project are awaiting clearance by the Rye authorities on zoning of the property.

Enka, N. C.—American Enka Corp., 206 Madison Ave., New York, N. Y., plans major expansion of company's nylon division at local plant here. Work on plant addition will get under way soon and will begin production sometime in 1960. Expansion program to cost about $7.5 million will more than double present plant capacity.

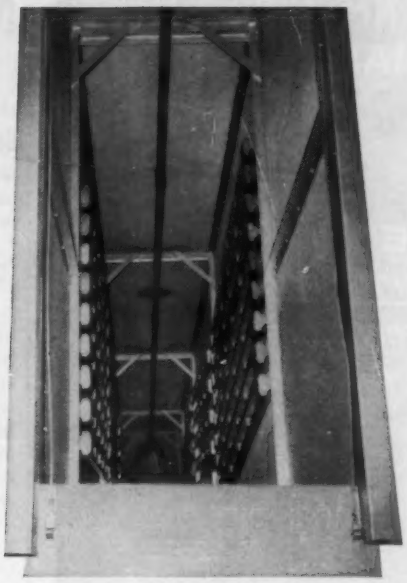
Cincinnati, O.—Randall Co., 5000 Spring Grove Ave., this city, plans to construct new plant for the manufacture of automobile parts and accessories. Plant will be a one-story reinforced concrete and brick building with a floor area of approximately 15,000 sq ft. Construction will begin at once for scheduled completion by spring of 1960. Cost reported to be about $150,000. Frankenberger, Junker and Lensky, 2910 Woodburn Ave., Cincinnati, O., is the architect-engineer of the project.

Lorain, O.—Lorain Products Corp., 1122 F St., plans to construct a new facility here. Plans call for the erection of a new building for the production of like products adjacent to present facility. Plant will be a one-story brick and steel structure with a manufacturing area of approximately 60,000 sq ft. Work under supervision of T. J. Hume, 435 Hamilton Ave., Lorain, O., will be completed by the fall of this year at a reported cost of $500,000.

Elmore, O.—Brush Beryllium Co. 4303 Perkins Ave., Cleveland, O., has authorized expansion program at company's plant here. Company plans to expand its rolling mill facilities at reported cost of $250,000. Work is planned soon for completion by early 1960.

North Canton, O.—Hoover Co., Die Casting Division, 101 Maple St., has awarded a contract to the Gibbons-Grable Co., Mellet Building, Canton, O., for the construction of a new 40,000-sq ft plant here. Work is already under way on the new facility. Cost reported to be over $450,000.

IF HEAT CAN CURE YOUR "GROWING PAINS"



From a cold start, this oven reaches operating temperatures (to 425°F) in about ten minutes. Conveyor speed is adjustable from 2 to 6 feet a minute and baking time from 5 to 16 minutes.

YOUR CHROMALOX MAN HAS THE **ANSWER**

By installing the oven shown above, a New England metalworking plant recently solved several problems arising from an expanded line of products.

Previously, some of the company's products had been sent out for painting and baking, while the remainder were painted and air dried at the plant. When a new, larger item was added to the product line, neither the company nor the outside firm was equipped to handle the paint baking. After considering the outside charges and delays which had caused them to lose some rush orders, it was decided to install their own oven. They then called in the Chromalox Man for a quick, economical, electrical answer.* Now, all painting and baking is done at home in a 32-foot electric radiant oven, using 42 Chromalox Type RAD Far-Infrared Heaters.

Chromalox Input Controllers accurately regulate baking temperatures for each of the three heat zones. With these cycling devices, capacity can be accurately controlled from 4 to 100% of heater capacity. Top or bottom sections of each zone can be shut off to handle varying work sizes.

Chances are your Chromalox Man can help you find answers to *your* production line heating problems.

**For a detailed account of this actual case history, write for Application Report 403.*

4982

CHROMALOX
Electric Heat
INDUSTRIAL • COMMERCIAL • RESIDENTIAL
EDWIN L. WIEGAND COMPANY
7553 Thomas Boulevard • Pittsburgh 8, Pa.

Call Chromalox

for the man with the ELECTRICAL ANSWERS to your heating problems

ATLANTA 9, GA.
Applebee-Church, Inc.
1389 Peachtree St., N.E.
Trinity 5-7244

BALA-CYNWYD, PA.
J. V. Calhoun Company
349 Montgomery Ave.
Mohawk 4-6113
Greenwood 3-4477

BALTIMORE 18, MD.
Paul V. Renoff Company
333 East 25th St.
Hopkins 7-3280

BINGHAMTON, N. Y.
R. P. Smith Co., Inc.
94 Henry St.
Phone 4-7703

BLOOMFIELD, N. J.
R. L. Faber & Assoc., Inc.
1246 Broad St.
Edison 8-6900
New York: Worth 4-2990

BOSTON 11, MASS.
Leo C. Pelkus & Co., Inc.
683 Atlantic Ave.
Liberty 2-1941

BUFFALO 2, N. Y.
Niagara Electric Sales Co.
505 Delaware Ave.
Summer 4000

CHARLOTTE 2, N. C.
Ranson, Wallace & Co.
116½ E. Fourth St.
Edison 4-4244
Franklin 5-1044

CHATTANOOGA 1, TENN.
H. R. Miles & Associates
P. O. Box 172
Amherst 5-3862

CHICAGO 5, ILL.
Fred I. Tourtelot Company
407 S. Dearborn St.
Harrison 7-5464

CINCINNATI 8, OHIO
The Smysor Company
1046 Delta Ave.
Trinity 1-0605

CLEARWATER, FLA.
J. J. Galleher
617-A Cleveland St.
P. O. Box 1376
Phone 3-7706

CLEVELAND 13, OHIO
Anderson-Boldt, Inc.
2012 W. 25th St.
Prospect 1-7112

DALLAS 26, TEX.
L. R. Ward Company
3009 Canton St.
Riverside 1-9004

DAVENPORT, IOWA
Volco Company
215 Kahl Building
Phone: 6-5233

DENVER 2, COLO.
E. & M. Equipment Co.
2415 Fifteenth St.
Glendale 5-3651
Genesee 3-0821

DES MOINES 14, IOWA
Midwest Equipment Co. of Iowa
842 Fifth Ave.
Cherry 3-1203

DETROIT 38, MICH.
Carman Adams, Inc.
15760 James Couzens Hy.
University 3-9100

HOUSTON 3, TEX.
L. R. Ward Company
3605 Polk Ave.
Capitol 5-0356

INDIANAPOLIS 8, IND.
Couchman-Conant, Inc.
1400 N. Illinois St.
Station A, P.O. Box 88023
Melrose 5-5313

KANSAS CITY 6, MO.
Fraser D. Moore Co.
106 E. 14th St.
Victor 2-3306

LOS ANGELES 15, CAL.
Montgomery Brothers
1053 S. Olive St.
Richmond 7-9401

MIDDLETOWN, CONN.
Dittman and Greer, Inc.
33 Pleasant St.
Diamond 6-9606

MILWAUKEE 3, WIS.
Gordon Hatch Co., Inc.
531 W. Wisconsin Ave.
Broadway 1-3021

MINNEAPOLIS 4, MINN.
Volco Company
831 S. Sixth St.
Federal 6-3373

NASHVILLE 4, TENN.
H. R. Miles and Associates
2500-B Franklin Rd.
Cypress 2-7016

NEW YORK CITY, N. Y.
See "Bloomfield, N. J."

OMAHA 2, NEB.
Midwest Equipment Co.
1614 Izard St.
Atlantic 7600

PHILADELPHIA, PA.
See "Bala-Cynwyd, Pa."

PITTSBURGH 6, PA.
Woessner-McKnight Co.
1310 Highland Building
115 S. Highland Ave.
Emerson 1-2900

PORTLAND 9, ORE.
Montgomery Brothers
1632 N.W. Johnson St.
Capitol 3-4197

RICHMOND 26, VA.
O. M. Thompson
Westhampton Station
P. O. Box 8762
Atlantic 8-8758

ROCHESTER 4, N. Y.
Niagara Electric Sales Co.
133 Clinton Ave. S.
Hamilton 6-2070

ST. LOUIS 1, MO.
C. B. Fall Company
317 N. 11th St.
Suite 1001
Chestnut 1-2433

SAN FRANCISCO 3, CALIF.
Montgomery Brothers
1122 Howard St.
Underhill 1-3527

SEATTLE 4, WASH.
Montgomery Brothers
911 Western Ave.
Main 4-7297

SYRACUSE 6, N. Y.
R. P. Smith Co., Inc.
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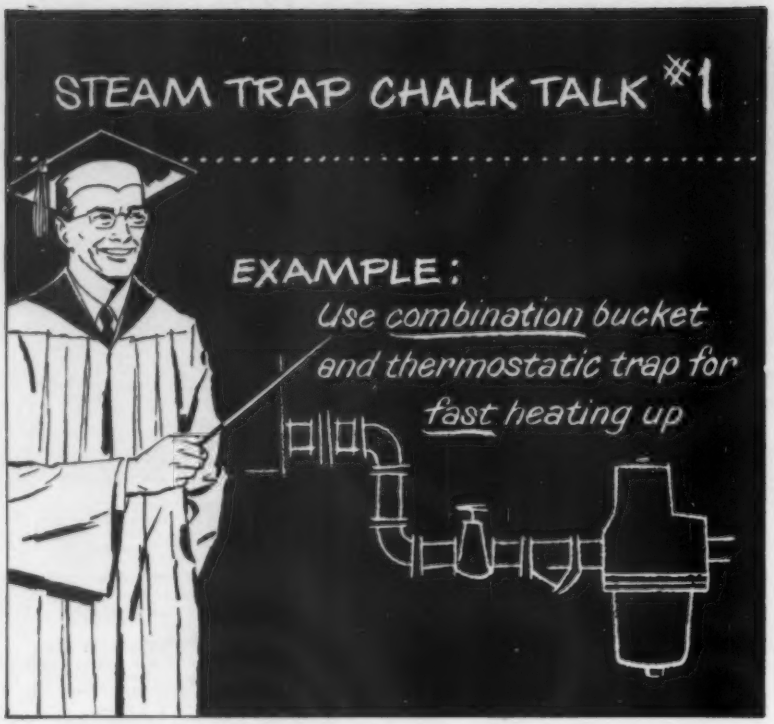

How proper trap selection increases heat transfer efficiency 35%

- It is of the utmost importance that the *correct* design of trap be used for each application. Standardizing on one design of trap for all applications reduces heat transfer rates up to 35%. As an example, for extremely fast heating up, a combination inverted bucket and thermostatic trap will shorten heat-up periods to 2½ minutes, eight times faster than conventional inverted bucket traps.

For other sound selection recommendations, send for Anderson's new engineering catalog, "How to Select Steam Traps". Here you will find valuable tips on which of the four basic types of traps—inverted bucket, thermostatic, combination or float—to use for any installation. Send for your complimentary copy. Mail the coupon today.

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NEW BOOKS

for the plant engineer

On Static Control

STATIC CONTROL. Size 11 by 8½ in.; 152 pp including index; illustrated; paper bound. Available from General Purpose Control Department, General Electric Co., Bloomington, Illinois. Price $5.00.

THIS APPLICATION manual delves into various facets of static control. In the introductory section, the logic concept used in this type of control is discussed. This discussion is followed by information on the fundamentals of static control and operation of General Purpose Control components.

The book continues with other topics, some of which are: general rules for circuit design; trouble shooting; repair and replacement; recommended test procedure; and special applications.

A glossary of technical terms is included; this acquaints the reader with some of the names that are used in static control parlance.

Electrical Equipment

ELECTRIC MACHINERY by Clifford C. Carr. Size 9¼ by 6⅛ in.; 1958 edition; 537 pp including index; illustrated; cloth bound. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N.Y. Price $9.25.

The author presents a good bit of information on electrical machinery in a coordinated manner; it is not broken down into two parts dealing separately with d-c and a-c machines. The author of this work has been teaching electrical machines as an integrated subject for many years.

The text begins with a discussion on terminology, units and symbols. Then in separate sections it deals with transformers, general principles of dynamos, polyphase synchronous machines, polyphase induction machines, d-c machines, and single phase motors.

An interchangeability table on magnetic units is offered in the appendix.

Structures

PHILOSOPHY OF STRUCTURES. Size 10¼ by 7¾ in.; 366 pp including index; illustrated; cloth bound. Published by the University of California Press, Berkeley, California. Price $12.50.

THIS BOOK is a translation of the work of an outstanding Spanish engineer and architect, Eduardo Tor-

rojo. The English version was made possible through the efforts of J. J. Polivka and Milos Polivka as well as the cooperation of others. The book sheds light on the principles that are basic to any building and presents ideals of advance structural design.

The nicely illustrated volume is a systematic, nonmathematical presentation. It deals with such subjects as prestressed concrete, retaining structures, supports, walls, foundations, construction methods, beauty of structures, static-resisting functionalisms, and bridges and aqueducts.

Grounds Maintenance

GROUNDS MAINTENANCE HANDBOOK. Size 9 by 6 approx; 501 pp including index; illustrated; cloth bound. Published by F. W. Dodge Corporation, 119 West 40th St., N.Y. 18, N.Y. Price $10.75.

This book is packed with a great deal of information on grounds maintenance and development. A common job of growing and taking care of grass is given a good bit of coverage which includes discussions on soil preparation, types of grasses, and weed control. This material is followed by a chapter on planting and care of trees.

In a chapter on maintenance equipment use and selection the author has given attention to such subjects as sprayers, power mowers, soil shredders, and post hole diggers.

Some of the many other topics discussed in the book are as follows: methods of erosion control; specifications for construction and maintenance of roads and parking areas; stump treatment; substations and pole yards; control of insects; and woven wire fencing.

Solid Materials Study

THE SOLID STATE FOR ENGINEERS by M. J. Sinnott. Size 9 by 6 in. approx.; 522 pp including index; over 500 pp; illustrated; cloth bound. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. Price $12.50.

Structure of matter is discussed in this book whose first chapter fittingly deals with atomic concepts. Then the crystalline makeup is spotlighted briefly prior to a discussion of X-Ray and electron diffraction. The latter is used to study the crystalline construction of solids. In addition to these subjects, here are some of the other topics taken up by the author: elastic and plastic deformation; metallic solids; molecular solids; mechanical properties of solids; thermal properties; and dielectrics and related properties. Each chapter represents a condensation of investigation.

Safety Practices

MODERN SAFETY PRACTICES by Russell DeReamer. Size 9¼ by 6 in. approx; 1958 edition; 357 pp including index; illustrated; cloth bound. Published by John Wiley & Sons, Inc., 440 Fourth Avenue, New York 16, N.Y. Price $7.00.

IN THIS GUIDE, comprehensive coverage of newly developed and tested safety methods is presented in four phases. They are: 1. Development of safe working conditions. 2. Job hazard analysis and personalized safety training. 3. Promotion of employee safety participation. 4. Enforcement of safety rules.

Among the many subjects discussed in this book are the following: The high cost of accidents; accident proneness; job hazard analysis; safety committees; safety engineering terms; principles of machine guarding; industrial noise; fire prevention methods; eye protection; grounding of portable electrical equipment; and responsibilities of the safety engineer.

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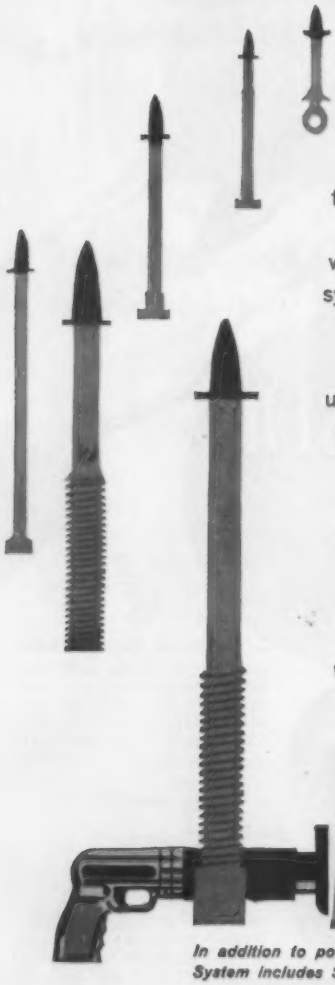

Ramset, and only Ramset, offers a complete line of "job-fitted" fasteners . . . guarantees the most economical fastener for every application. Versatile Ramset is the best-known and most widely-used powder-actuated fastening system in the entire maintenance field.

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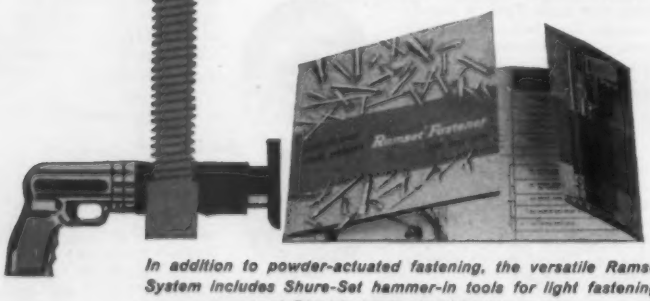

In addition to powder-actuated fastening, the versatile Ramset System includes Shure-Set hammer-in tools for light fastening, and Ringblaster heavy-duty kiln gun.

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Putting a Roof to Work

(Continued from page 115)

proper isolation of high-temperature ovens from the steel structure of the buildings, etc.

The chief problem revolved around the ability to design and purchase oven equipment which would be suitable for outdoor installation and still not encounter heavy cost increases or bulky appearance which would spoil the over-all architecture of the building.

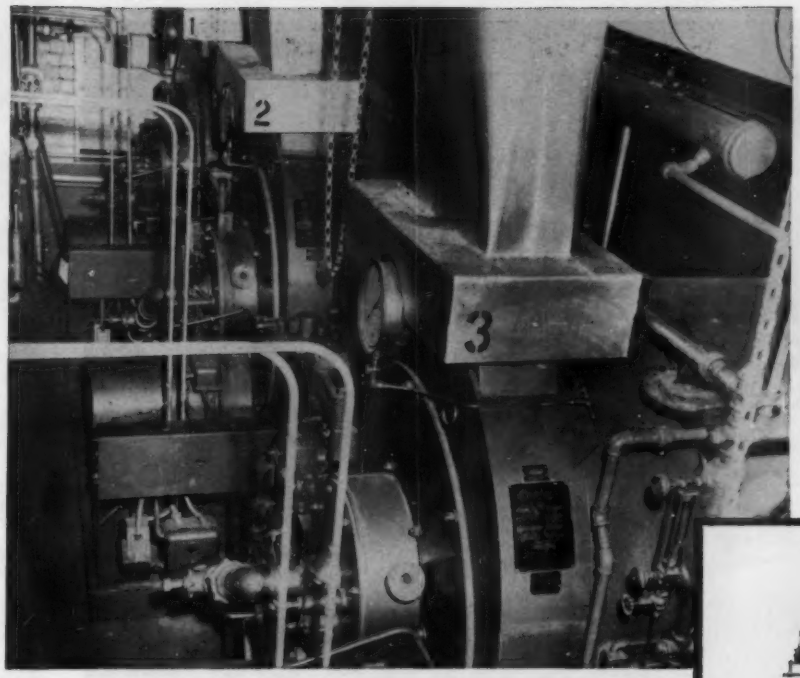
When high-temperature ovens are located directly on the structural steel at the roof line, the danger of heat transfer is imminent and bothersome in connection with structural steel distortion, conflict with sprinkler system, and interference with plant ventilation. To avoid this situation, the platform holding the ovens had to be isolated from the building interior in such a way as to eliminate objectionable heat transfer. This was accomplished by adequately designed ventilation between the roof line and floor of the oven.

Access to Roof

It was also recognized that roof location for ovens, ventilation systems, and electrical substations would require some means of convenient heavy-duty access. A freight elevator which extends above the roof line, with doors opening at roof level, and walkways to the various "roof rooms" were designed and estimated as part of the economic justification of the program.

The actual location of ventilation systems and substations was an important factor to be considered because of the room which had to be erected. Careful study of requirements showed that these two service units could be combined in a most efficient and effective way.

The economic "balance sheet" showed the idea of locating these facilities on the roof to be a worthwhile consideration and now operational experience has proven the decision wholly correct. **End**

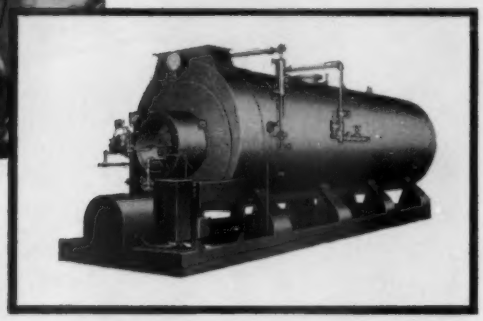


HERCULES-GALION PRODUCTS, Inc., Saves $15,000 Per Year!

Hercules-Galion Products, Inc., of Galion, Ohio, makers of dump truck bodies, ready-mix concrete truck equipment, and steel burial vaults, retired two old style boilers.

To improve heating efficiency, they installed three Cyclotherm 125 h.p. combination light oil/gas package steam generators. The total savings per year comes to $15,000.

As growing production or expanding plant facilities require more steam, Cyclotherms can be added when needed.



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Steam capacity that grows with the plant!

When you recommend Cyclotherm Steam Generators you recommend a steam source that can be quickly and economically expanded to meet plant expansion. For Cyclotherm's wide range of capacities permits the addition of exactly as much new capacity as may be needed at any time. Will 518 lbs. of steam per hr. suit the requirements? That's what a 15 HP Cyclotherm produces. Or are 25,875 more steam lbs. per hour wanted? In that case, a 750 HP Cyclotherm fills the bill. And between these extremes there are sixteen intermediate sizes to choose from.

Compact Cyclotherms are also kind to boiler room space – the Cyclotherm is up to ⅓ smaller than the ordinary package boiler. Installation is easy—no costly stack, no excavation, no foundation. The Cyclotherm is shipped complete – ready to operate. Burner and boiler are built together to work together with *one* manufacturing responsibility back of the entire unit.

Cyclotherm's Cyclonic Combustion guarantees a minimum of 80% efficiency. Larger units operate at from 30% to 100% of rated capacity with no loss of efficiency. Smaller units operate on and off automatically according to load requirements. With simpler design and fewer parts, Cyclotherm reduces maintenance costs by from 30% to 50%. Cyclotherm's world-wide service organization gives prompt service on every call. For full information, write us today.

There are 18 Cyclotherm models, ranging from 15 HP to 750 HP. Burns oil and/or gas. The Cyclotherm meets all state requirements and is built in accordance with A.S.M.E. and National Board Standards and bears the label of Underwriters' Laboratories, Inc. Guaranteed against any defect in materials or workmanship. Cyclotherm also manufactures a complete line of Hot Water Generators in 10 capacities, from 670,000 BTU per hr. to 6,700,000 BTU per hr.

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Please send me your booklet *Cyclotherm Cyclonic Combustion*, also rotogravure copy of *Cyclotherm Sales Steam* with illustrations and descriptions of Cyclotherm installations.

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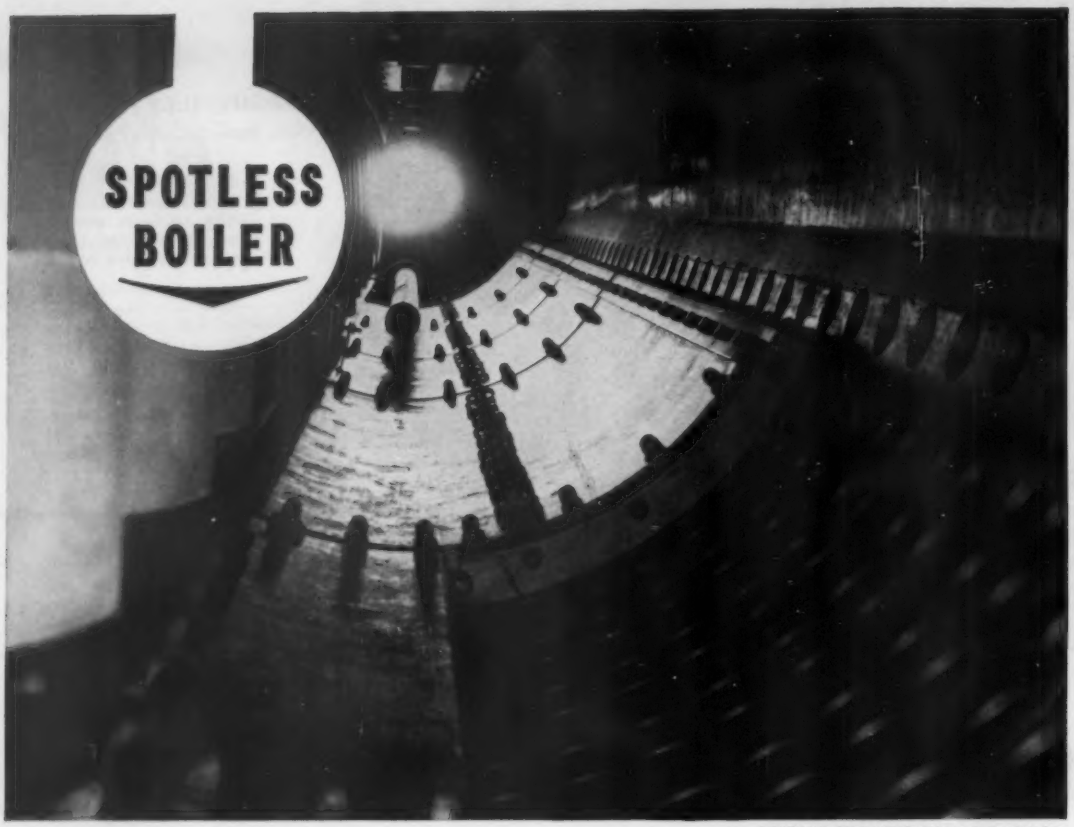
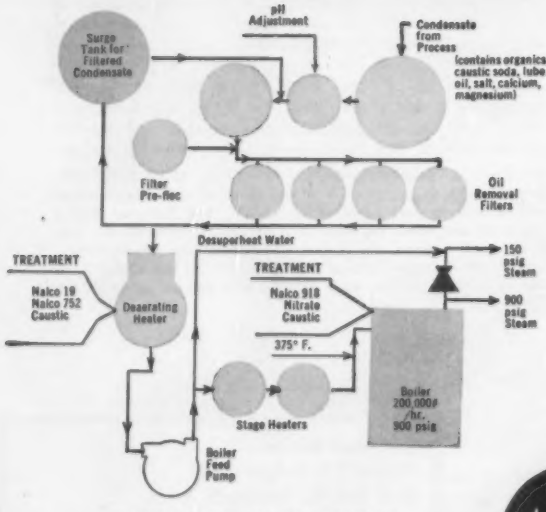


PHOTO COURTESY OF THE DOW CHEMICAL CO.

even though it operates on Contaminated Condensate!



FEEDWATER FLOWSHEET...
Pittsburg, California Plant of The Dow Chemical Co.
Nalco's continuous advisory service, easily as important as chemicals in solving this problem of contaminated condensate, simply doesn't fit into a chart. Consulting Service, in any water conditioning program, complements equipment and specialized services. It is part of the Nalco package . . . of results!

Contaminated condensate from process systems presents a complex water conditioning problem for boiler plant operators. In this system the solids in raw condensate run 15 to 80 ppm. Contaminants are lube oil and other hydrocarbons, caustic soda, salt, and traces of calcium and magnesium . . . a topnotch formula for promoting scale and sludge formation.

Working closely with a superbly cooperative plant operating staff, a Nalco Representative developed the water treatment plan. He provided the continuous counsel and coordination that keeps the boiler as it is shown here: free of sludge and scale . . . clean-to-metal after a full year's operation.

You, too, can count on the Nalco System for permanent, economical answers to water treating problems. Write or 'phone for details.

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BULLETINS

(Begins on page 21)

144 Roof Ventilators — Construction features, capacities, quietness levels and accessories of company's centrifugal type roof ventilators are covered in 8-pp Bulletin 4004. Capacity table and table of relative quietness levels are included, as well as dimension data, photos and specifications. American Blower Div., American-Standard.

145 Blowers, Exhausters—Bulletin B-7, 24 pp, describes centrifugal type blowers and exhausters for air or gas. Operating features are detailed and sectional views showing design and construction details are included, as well as general specifications, capacity and rating tables, and a section on fundamental engineering laws for blower applications. Billmyre Blower Div., Lamson Corp.

TOOLS, WELDING

146 Grinding Tools — Twelve-pp Bulletin 6065 describes and illustrates the Hi-Torque Handee and Hi-Power grinders and accessories. Give full information on the Handee and its many uses, operation instructions, and suggested applications. Also shows mounted wheels, saws, brushes, cutter, drum sanders and bands available for use with the versatile tool. Chicago Wheel and Mfg. Co.

147 Saw Blades—Bulletin 578, 31 pp, presents guides for getting maximum cutting performance and blade life; shows how to select proper blade, correct feed, speed and tension, and tabulates sizes and types of blades available. Common cutting problems and their solutions are tabulated as well as recommendations for cutting metals and non-metals. Ladish Co.

148 On Resistance Welding—Bulletin PP-54, 28 pp, on principles and practices of resistance welding, covers spot welding, projection welding, seam welding, flash welding etc. Provides a working knowledge of basic principles, and includes a resistance welding formula, data on calculating welding pressures, time in cycles, current in secondary amperes, tip diameter. Includes pertinent data on welding mild steel, high carbon steel ternplate, tin plate, galvanized steel, stainless, copper, aluminum. The Federal Machine and Welder Co.

149 Gas Regulators—Form ADC 705F is a 36-pp catalog covering cylinder, manifold and station pressure regulators. Contains flow and pressure specifications, as well as inlet and outlet connection dimensions, for each regulator. Adapters, station valves, flowmeters, hose connections and pressure gages are also described. Air Reduction Sales Co., Air Reduction Co., Inc.

150 Welding Platens—Bending blocks or welding platens, stands and accessories are featured in this product bulletin. Typical applications are illustrated, and a number of tools and accessories shown. An accompanying mailer shows recently introduced welding platen tools—horizontal clamp, bending post, and others. Acorn Iron & Supply Co.

FILTERING

151 High Efficiency Filters—Eight-pp Bulletin 238 describes three types of mechanical filters designed to provide super-clean air for critical cleaning problems: Type F, Airmat Deep Bed, and Multi-Pak. Contains illustrations of media and full assemblies, as well as filter selection tables, charts of engineering data, and performance curves. American Air Filter Co., Inc.

152 Improved Filters—Bulletin GEO-507 describes Fulflo filters for compressed air and other gases, covering single tube models for operating pressures from below 125 psi to 4000 psi, and flow rates to 800 scfm, also multi-tube models for high flow rates. Includes technical information and charts on flow characteristics, dimensions. Commercial Filters Corp.

ELECTRICAL

154 Wet Winding Motors—Bulletin GEA-6883 describes submersible wet winding motors designed to run under water even with insulation and bearings immersed. The motors utilize irradiated polyethylene insulation and are rated 100 to 500 hp. Cutaway diagram, rating chart and dimensions. General Electric Co.

155 Short, Drip-Proof Motor—Bulletin 2150 describes the drip-proof Pancake motor featuring substantial reduction in motor length. Presents engineering information on this flange type motor. A cutaway drawing shows how it achieves short length through formed end coils and one-piece housing-bearing bracket. The Louis Allis Co.

156 Smaller Transformers—Advantages of Curvacore construction on company's three-phase transformers in ratings through 150 kva are described in 8-pp Bulletin 61B9049. The design is described as making possible reduced weights and heights, affording faster installation and neater appearance as well as high thermal capacity and good regulation. Allis-Chalmers Mfg. Co.

157 Metal-Clad Switchgear — Construction and design features of company's 4.16-kv horizontal drawout metal-clad switchgear with "Ruptair" circuit breaker are described in 12-pp Bulletin 18 B 6346C. Features and advantages are detailed and illustrated, and cutaway views, dimensional diagrams and specifications included. Allis-Chalmers Mfg. Co.

158 Anode Switchgear—Bulletin GEA-6841, 6 pp, gives information on function and application of company's type AG-6 anode switchgear —a protective component of mercury arc rectifier equipment when continuity of service for large and/or essential d-c loads is necessary. Includes construction features, circuit diagrams. General Electric Co.

159 Enclosed Switches—Twenty-pp Catalog 83C, on industrial switches, gives details on nine housing groups of these metal enclosed switches, including explosion-proof, maintained-contact, pre-wired, hand-operated and sealed types. Booklet lists switches with a variety of actuator types to fulfill almost any requirement for general purpose enclosed switches. Micro Switch, Div., Minneapolis-Honeywell Regulator Co.

160 Time Switch Selection—Catalog 159, 8 pp, shows how to select a time switch and includes section devoted to explanation of switching and timing. Typical wiring diagrams and explanations of "what switches what" are provided, also a formula for selection of the proper timing. Gives data on standard time switches, others. Tork Time Controls, Inc.

161 Magnetic Starters—Bulletin EN-150 contains 15 pp of detailed information on a-c magnetic starters for reversing and non-reversing single phase and squirrel cage motors. Component units and elements, including magnet coils, overload relays, contact assembly, enclosure types, are fully described, and ratings are provided. Cutler-Hammer, Inc.

162 Mercury Arc Rectifiers—Bulletin GEA-6848, 12 pp, covers operation, construction features and applications of company's pumpless mercury arc rectifiers from 750-kw, 250-v units for industrial service to units rated over 5000-kw, 850v for electrochemical service. Includes cross-section line drawing of pumpless tank, photos, charts, system diagram and rating tables. General Electric Co.

On the facing page are postage-free Reader Service Cards provided for your convenience in ordering these bulletins. You may also use the cards to order any literature mentioned in ads.

163 Underfloor Raceways — Illustrated with drawings and photos, 52-pp Catalog 539B gives information on a variety of underfloor distribution systems. Also covered are service fittings, boxes, and saddle supports. Suggested specifications, typical layouts, application and installation information, and data tables and charts are included. National Electric Products Corp.

164 Isolated Phase Bus—Bulletin GEA-6874, 12 pp, gives detailed information on features and application of company's unit-supported isolated phase bus with zero force design that reduces fault current stress on conductors and insulators. Includes photos, cutaway and line drawings, rating and dimension tables, line drawings of flexible bus arrangements, and in-

BULLETINS

(Begins on page 21)

formation on bus for generator currents above 8,000 amp. General Electric Co.

165 Silconic Battery Plate—Bulletin GB-1876 describes a process for introducing arsenic and silver cobalt sulphates into the active materials of the positive plates of motive power batteries. Advantages of this process in prolonging battery life and improving electrical characteristics given. Gould-National Batteries, Inc.

166 More Power for Trucks—Form 6230, an 8-pp technical bulletin, describes new Exide-Ironclad storage batteries which boost the work capacity of electrical industrial trucks. The batteries can be used interchangeably in more than one size of truck. Ordering information included, typical sizes shown. Exide Industrial Div., Electric Storage Battery Co.

METALS

167 Molybdenum in Steel Castings—This 36-pp brochure on the role of molybdenum in steel castings for industrial equipment discusses hardenability, tensile properties, fatigue, harness, wear and impact resistance, machinability, and weldability of cast steels. Graphs and charts accompany text. An illustrated section covers role played by heat treated low alloy steel castings used in earth moving equipment. Climax Molybdenum Co.

168 Steel Buyers Guide—"Buyers' Guide for Stainless Steel Products and Services," is a 159-pp book listing some 3000 firms making products of stainless steel. Contains 188 specific and general product categories followed by manufacturers' names. Many of the listings of fabricators and those who perform services are arranged geographically. A special table lists mill suppliers and the forms and shapes they produce. Book is available to qualified plant engineers. Please state your job title, when requesting it. American Iron and Steel Institute.

169 Wrought Copper—A listing of properties, forms and composition of wrought copper and copper-base alloys is presented in this 14-pp booklet. Lists nominal composition, available forms and physical properties of the alloys. Tensile, yield and shear strength, and elongation of the alloys, both hard and soft, ratings for corrosion resistance, as well as hot working and annealing range, and fabricating properties are also featured. Olin Mathieson Chemical Corp.

HEATERS, HEATING

170 Space Heaters — Engineering Data Bulletin A/2 contains 8 pp of construction details and specifications on 10 models of space heaters for gas, oil or gas-oil firing, ranging from 400,000 to 2,000,000 Btu/hr output. Includes dimensions for up-flow, down-flow and horizontal installation, control elements. Reznor Mfg. Co.

171 Surface Heating Tips—Bulletin GEA-6146B shows how to select equipment and controls for surface heating. Tells how to determine type of heater, ratings for surface or platen heating, heat-up time for metallic platens. Includes tables for heater selection, heat absorption in kilowatts of material in process, platen heat losses. General Electric Co.

172 Convertor Selection—Twelve-pp Bulletin 303-A shows how to select hot water heating convertors, and contains construction and operating data. Information includes product dimensions, connections, operating capacities, temperatures, and pressure losses covering usual ranges for standard water heating systems and general ranges for radiant heating systems. Patterson-Kelley Co., Inc.

173 Deaerating Heaters — Revised Bulletin WC-106A, 12 pp, on tray-type deaerating heaters, covers principles of deaeration, tray heater operation, standard design and applications, accessory equipment. A section on design discusses load variations, installation, metallurgy and construction of the trays. Graver Water Conditioning Co.

MATERIALS HANDLING

174 Handling System—Twenty-pp Catalog 7 illustrates and describes Tote system of bulk materials handling. Covers bins, tanks, tilts and accessory equipment, used in conjunction with automatic filing and discharge stations, in inter and intra plant operations, in conjunction with both batch and continuous process activities. Tote System, Inc.

175 Metal Baskets, Racks—Eight-pp Catalog MS-57 illustrates and describes a variety of custom-built baskets, racks and metal specialties for materials handling and processing. Advantages of design are detailed and applications shown. Wire & Iron Products, Inc.

176 Electric Hoists — Twelve-pp Bulletin 158-G describes electric hoists, including three larger capacity and higher speed models. Design and construction features are detailed, performance advantages pointed out. Specifications, dimensional diagrams included. Chisholm-Moore Hoist Div., Columbus McKinnon Chain Corp.

177 For Vertical Handling—This 20-pp booklet is an industry-sponsored basic reference guide on portable elevators. It defines the portable elevator and illustrates its advantages and applications for vertical material handling. Tells how to select a portable elevator and discusses various types. Also offers information on lifting-lowering mechanisms, sources of power, lifting-lowering carriage variations. Covers briefly the 92-year history of these elevators in industry. Association of Lift Truck and Portable Elevator Manufacturers.

178 Let Vacuum Lift It—Safety, speed and economy advantages of material handling with vacuum are stressed in 8-pp Catalog VL-1 on Vac-U-Lift systems. Photos show units at work in handling objects ranging in weights from ounces to many tons . . . structural steel, concrete slabs, brick sections, thin sheets etc. Vac-U-Lift Co.

179 Conveyor Belts—Data Sheet 2470 describes advantages and construction features of heavy industrial Koroseal conveyor belts for use in contact with cutting oils and greases in metal-working plants; chemical plants where belts handle wet, sticky materials; in pulp mills, glass plants, plastic, textile plants, others. B. F. Goodrich Industrial Products Co.

180 For Better Parts Storage—Equiptogram 206 is a 16-pp illustrated catalog of equipment designed for economical and efficient storage of parts. Gives application suggestions, sizes and prices on steel cabinets, drawers, shelving inserts, shelving, bins, benches, stands. Equipto Div., Aurora Equipment Co.

SPECIAL MATERIALS

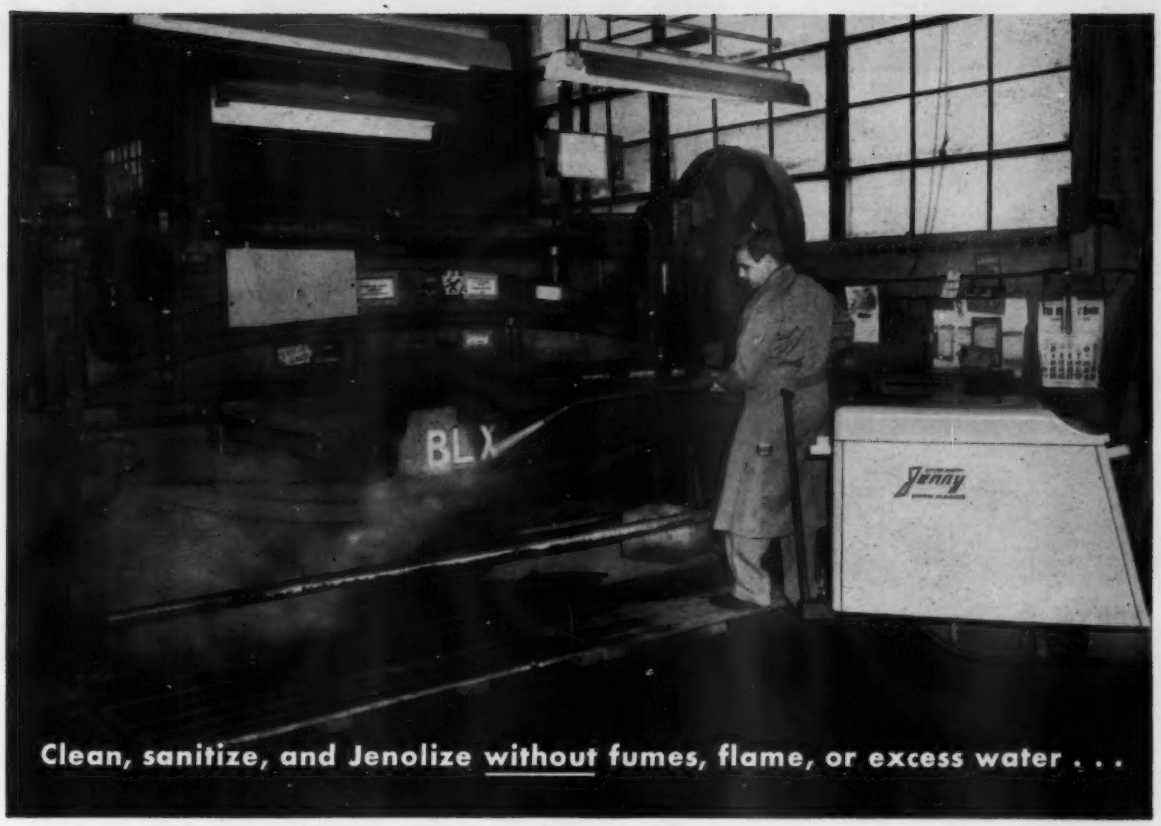
181 On Nuclear Graphite—Technical data on manufactured graphite for nuclear applications is contained in 8-pp Catalog Section S-4905. Gives tabular data on average properties, as well as comparative data on graphite vs other materials used for moderators, reflectors. National Carbide Co., Div., Union Carbide Corp.

182 Silicone Products—The 1959 Reference Guide to company's silicone products tells which silicones can best meet the needs of a variety of problems ranging from adhesives to release agents, resins to rubbers, dielectrics to water repellents. Contains graphic examples of typical applications, as well as detailed selection data. Dow Corning Corp.

183 Molded Fiber Glass—Featured in this 32-pp brochure is detailed information on molded fiber glass and methods used to produce it. Illustrated with photos, line sketches and charts, catalog lists mechanical, electrical and chemical properties of molded fiber glass. Also describes fabricating and finishing operations which can be performed on this material. Molded Fiber Glass Co.

184 Urethane Foam—Properties and characteristics of urethane foam are illustrated and described in this 12-pp fact file. A variety of applications are illustrated, and laboratory and test data on the material is given in graph form. Mobay Chemical Co.

185 Phenolic Products—Eight-pp Booklet CDC-358 describes phenolic resins, varnishes and molding powders. Includes product features, special properties, and detailed technical data on phenolic molding powders, laminating varnishes, phenolic foundry resins, industrial resins and varnishes. General Electric Co.



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Model E-350 combines the right amounts of heat, pressure, and cleaning solution to handle the majority of cleaning jobs at savings of up to 80% in time and labor costs. Its compact size, portability, low water output, and quiet operation without flame, smoke, or fuel fumes, make it ideal for use practically anywhere in the plant.

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Hypressure Jenny Division, P. O. Box 207, Coraopolis, Pa.

For more facts circle 617 on Reply Card

BULLETINS

(Begins on page 21)

OTHER EQUIPMENT

186 Power Lubrication Systems—Featured in 32-pp Catalog 81 are lubricant application equipment, fittings and accessories. Describes completely automatic centralized systems, semi-automatic and manual methods of lubricating machines. Photos, drawings and diagrams illustrate design. Lincoln Engineering Co.

187 Data Processing Functions—Form U-1363 is a 24-pp booklet on functions of Univac data processing equipment. Illustrates broad range of basic functions and shows specific equipment to execute them. Explains technique of processing unit facts—whether in punched cards, perforated paper tape, or magnetic tape. In all, 15 functions are detailed, including card punching, verifying, interpreting, reproducing, others. Remington Rand Div., Sperry Rand Corp.

188 59 Good Ideas—Titled, "59 Ideas for Modernization in '59," this 20-pp booklet presents examples of company's products in a wide range of industrial operations. Each brief, illustrated case history, tells how the particular product development contributes to more efficient operation, makes possible a saving in operating costs, solves a specific problem, promotes greater safety etc. Electrical, pumping and materials handling equipment are covered. Allis-Chalmers Mfg. Co.

189 Teflon for Machining—This 28-pp catalog and machining handbook presents Teflon tubing and rod available for machining into parts of every type, sizes from 3/16 to 18 in. diam. Sizes are listed and machining methods, speeds, feeds and tool design for machining are detailed. Halogen Insulator & Seal Corp.

190 Gas Turbine Drivers—Bulletin 166 presents a 10-pp analysis of economic aspects of combustion gas turbine application in the refining industry. Emphasis is given to turbine design, operating characteristics and profitable use of a turbine's double function as a source of power and heat. Performance charts on fuel consumption, included. Clark Bros. Co.

191 On Fluid Mixing—Facilities offered by this company for solving fluid mixing problems are described in 6-pp Bulletin B-516, Laboratory equipment and research facilities for solving a variety of fluid mixing problems for industry are illustrated. Mixing Equipment Co., Inc.

192 Cleaning, Phosphated Method—This illustrated 16-pp manual describes features and advantages of company's steam cleaner phosphating process. Discusses methods of application, explains where steam cleaner method best fits, cites specific installations, and gives figures on installation costs. Malsbary Mfg. Co.

193 Inhibitor Papers—Corrosion and tarnish inhibitor papers are the subject of this manual which contains more than 75 pp of descriptive information, applications charts, case histories, and actual paper samples. Manual is divided into three sections: volatile corrosion inhibitor paper for prevention of rust on ferrous metals; Silver Saver, to eliminate tarnishing on silver and silver plate; and Coppertex, which protects against corrosion on copper and copper alloys. Other sections give general information relative to industrial corrosion problems. The Orchard Paper Co.

194 Welded Assemblies—Intended as a quick-reference to the type of welded assemblies this company produces, this 60-pp catalog features large pictures of some typical assemblies along with pertinent information on material size, weight etc. Assemblies shown include engine compartments, transformer cases, nuclear energy parts, flange and valve units, doors and frames, assemblies built for specific industrial applications, others. Lists 94 materials which company has welded and can fabricate. The American Welding & Manufacturing Co.

195 Side Crank Presses—Comprehensive 44-pp Bulletin 64 introduces a redesigned and expanded line of straight side single and double crank presses. Contains complete illustrated information on all operating and structural features, as well as useful charts and tabulated information concerning punch and press speeds, detailed specifications, and a special section dealing with enclosed models. Niagara Machine & Tool Works.

196 Extrusion for Wire, Cable—The technique of extrusion for electrical wire and cable, particularly of Alathon polyethylene resin and Zytel nylon resin, is covered in 16-pp Bulletin WC-2. Complete with trouble-shooting charts, covers design of tubing and pressure dies. E. I. du Pont de Nemours & Co., Inc.

198 Copying Techniques—How office copying can save money and increase efficiency is explained in this 16-pp illustrated booklet. Various types of copiers are illustrated and described and typical applications pictured. Eastman Kodak Co.

199 Cooling Coils—Chilled-water, cooling coils in a wide range of sizes for central station and zone air conditioning systems are described in Bulletin CWC-200. Ratings charts included. Halstead & Mitchell.

200 Scaffolding System—Featured in this booklet is Swiss-Lok, a simplified system of scaffolding designed for rigidity, fast erection, easy handling and storage, and heavy loading. Advantages are detailed and assembly method is illustrated in detail. Swiss Fabricating, Inc.

201 Anodes, Plating Chemicals—Eight-pp Bulletin AC-111, on anodes and plating chemicals, covers composition, shapes and specific application. Illustrated by photos and line drawings are a wide variety of anodes, anode hooks and anode bags. Specifications are given for round, flat, elliptical, and specially shaped anodes, including nickel, cadmium, brass, bronze, copper, zinc, lead. Hanson-Van Winkle-Munning Co.

DATA FILE of literature for the plant engineer's library

STANDARD CATALOGS, bulletins and handbooks are listed to help plant engineers maintain a permanent data file. To get these free catalogs, circle item numbers of those wanted on postage-free cards provided on pages 181 and 182.

VALVES, TRAPS, PIPING

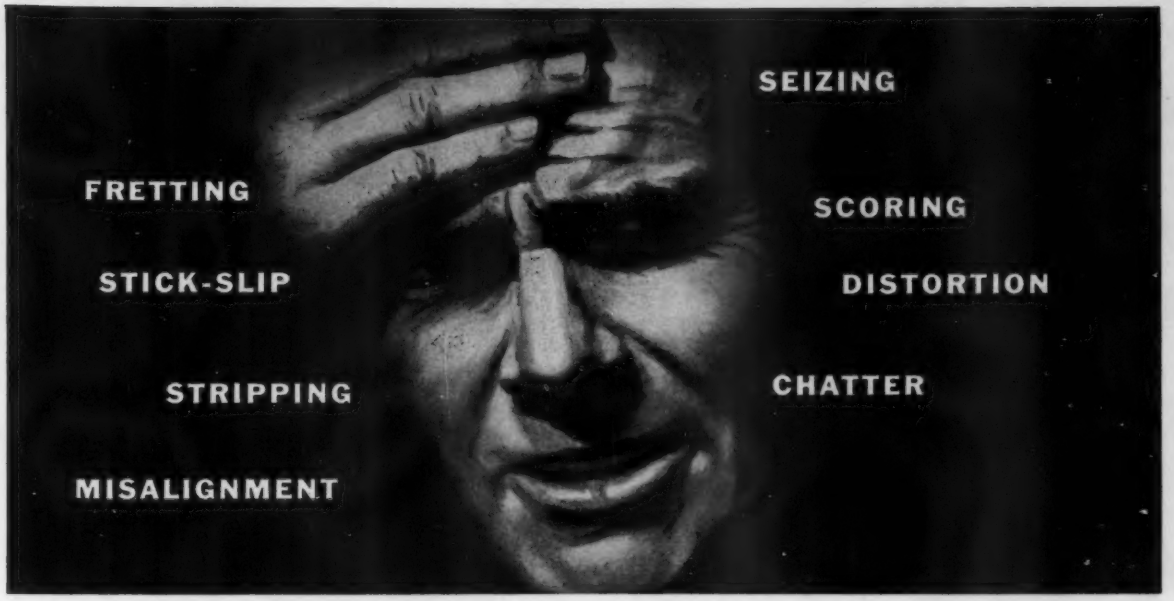
301 Valve Performance Facts—Included in this 36-pp booklet are 32 case histories of cost-saving valve installations. Service applications covered include steam, oil, water, coating fluid, chlorine, phenol, pulp stock, vacuum, others. Crane Co.

302 Industrial Valves—Bulletin 507V illustrates and describes company's line of industrial valves for control of air, gas, liquids and solids. Features photos and descriptive detail on a variety of valves, including butterfly valves, water valves, slide valves. W. S. Rockwell Co.

303 Blow-Off Valves—Bulletin B 427, 20 pp, describes features and advantages of company's blow-off valves for boiler pressures up to 415 lb. Covers construction details, materials used in the valves, and includes specifications, weights and dimensions, tables of average physical and chemical properties of materials, etc. Yarnall-Waring Co.

305 Stainless Steel Valves—Corrosion resistant stainless steel valves are featured in 32-pp Catalog 59SS. Features of design and construction are shown through cutaway views, and advantages of stainless steel in withstanding corrosive attack of chemicals and atmospheres are detailed. Corrosion resistance table is included, as well dimensions. Jenkins Bros.

306 Valve Lubrication—This 19-by-24-in. chart contains maintenance and lubrication information for company's lubricated plug valves. Of heavy paper with metal edges, the chart features detailed exploded views of four types of valves and includes a table of recommended lubricants. Meter and Valve Div., Rockwell Co.



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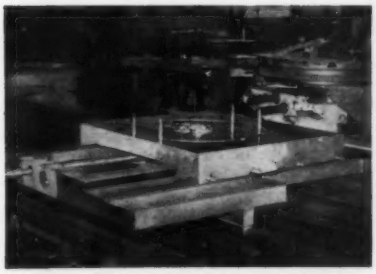
How is it possible? . . . Simply wipe a thin coating of Molysulfide grease—or Molysulfide concentrate—on the surfaces to be lubricated. The Molysulfide quickly forms a high strength layered film that prevents metal to metal contact, and lubricates even under severe load conditions . . . where conventional lubricants are wiped off or forced entirely out of the critical area.

Four main properties of Molysulfide explain why it is so effective: (1) It is as slippery as ice. (2) Resists excessive pressures. (3) Lubricates over a wide temperature range −275°F to 850°F. (4) Sticks "like glue" to metal.

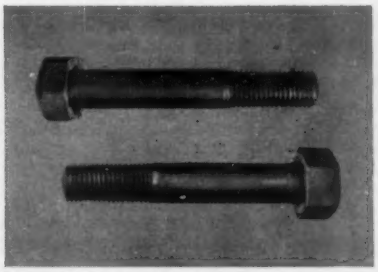
No other known substance equals Molysulfide heavy-duty lubricant as an immediate cure for galling and seizing of threaded connections . . . scoring and distortion of press fits . . . stick-slip or chatter on machine ways . . . fretting on splines . . . or for similar troubles involving gears, cams, collets and chucks.

Which lube headache can it solve for you? You can discover in virtually a single application.

Order a pound of Molysulfide, in either powder or concentrated grease form, from any one of the manufacturers below.



No slip-stick action at low speeds on machine tools gibs and ways when they're greased occasionally with Molysulfide heavy-duty lubricant.



No seizing. Service dismantling of powerhouse generator reveals bolts in top condition 21 months after Molysulfide lubrication.

Press fitting without galling. Both assembly and disassembly of locomotive drive journal go smoothly when Molysulfide lubricant is used.

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Heavy-duty lubricants containing Molysulfide are now available nationally. Order from any of these well-known manufacturers:
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DATA FILE

(Begins on page 186)

308 Pressure-Reducing Valve—Bulletin J-160 describes features and advantages of company's pressure reducing valve for dead end shut-off and positive pressure regulation. Operation details are shown on cutaway view, and recommended capacities given on tables. Jordan Corp., Div. of OPW Corp.

310 On Steam Traps—Catalog K is an enlarged 48-pp manual and steam trap catalog. New material provided includes open float and thermostatic traps, pipe strainer to 6 in. in steel and semi-steel, and helpful steam pipe sizing tables. Discusses fundamentals of good trapping, trap selection, installation, testing, trouble-shooting, and repairs. Armstrong Machine Works.

311 Manual on Traps—This 40-pp engineering manual is designed to assist in the sizing, specifying and selection of steam traps and other fluid specialties. Includes steam trap selection guide, explanation of four basic types of traps and how they perform their function, four steps to follow in sizing a steam trap, table of factors and detailed instructions on how to select steam traps for over 45 major classes of equipment. The V. D. Anderson Co.

312 Guide to Couplings—This 26-pp general catalog describes company's quick-connect, quick-disconnect couplings, including a coupling for high pressure applications, for impact in air lines, for low pressure applications, for vacuum and very low pressures, and difficult fluids. Snap-Tite, Inc.

313 Fluid Line Couplings—Catalog 100 contains data sheets describing company's line of quick-connective fluid-line couplings for pneumatic, hydraulic, oxygen, acetylene, steam, various gases and liquids service. Photos and dimensional diagrams are included, as well as tables of dimensions and other engineering data. The Hansen Mfg. Co.

314 Swivel Joint—Features and advantages of company's swivel joint which permits fast, easy packing interchangeability are illustrated and described in this product bulletin. Table of specifications and properties is included, as well as dimensional data and diagrams. Chiksan Co.

315 Bellows Design Guide—Twenty-pp Catalog 155 contains helpful information on applications, design considerations, and standards for metallic bellows. Details on using bellows manufactured from various metals are included. Flexonic Corp.

316 Expansion Joints—Features and advantages of company's line of expansion joints and flexible couplings are illustrated and described in 12-pp Form AD-137. Standard dimensions and other engineering data are included. The Garlock Packing Co.

INSULATION

317 Insulation Specifications—This set of six specifications covers applications of Foamglas insulation for industrial equipment and piping. Each booklet contains tables of suggested thicknesses of insulation to be applied, drawings of installation procedure, supports, and recommended finishes. Booklets are devoted to low-, medium-, high-, and dual-temperature equipment and piping, to underground piping, and spheres. Pittsburgh Corning Corp.

318 Pipe Insulation—This 40-pp catalog was designed as a reference guide to company's pipe insulation, presenting a new way to specify proper thickness for pipe insulation, based in the "J" factor. This special index eliminates complicated computation formerly required to determine economical thicknesses. The book also features detailed drawings that show how single-layer insulation is applied to various vertical and horizontal expansion joints as well as to pipe bends, flanges, fittings. Union Asbestos & Rubber Co.

LUBRICATION

320 Plug Valve Lubricants—Reference Book 39—Section 5A, 16 pp, describes company's plug valve lubricants and lubrication accessories. Standard lubricant table gives detailed description and extreme temperature range of each lubricant. Homestead Valve Mfg. Co.

322 Organized Lubrication—Benefits of organized lubrication are extolled in this 24-pp bulletin. Cost control opportunities are detailed and the task of assigning responsibilities and delegating authority in an organized lubrication system discussed. Method of determining savings and setting up records to measure results covered. The Texas Co.

324 Product Guide — This handy little booklet gives information on manufacturer's line of industrial products—general lubricants, greases, diesel lubricating oils, metalworking oils, hydraulic oils, heat-transfer oils, waxes, petro-chemicals, spray oils, solvents, electrical oils and others. Sun Oil Co.

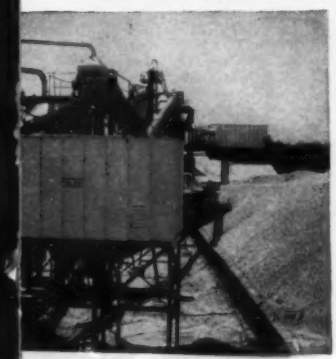
325 Lubricant Data — Characteristics, advantages of company's line of specialized fluid and grease type lubricants are described in 32-pp Data Book 59-1. Includes sections on control of friction, use of grease type lubricants, proper applications, and recommendations for various operating conditions. Lubriplate Div., Fiske Brothers Refining Co.

PACKING AND SEALS

326 External Mechanical Seal — Bulletin CP-551 features a mechanical seal designed for complete interchangeability with packing in stuffing boxes of pumps and other rotating

Walkway to efficient dust control

Pangborn Cloth Bag Dust Collector on the job. This is just one of Pangborn's complete line of wet and dry dust collectors.



See those bags? They're the *collect* in the Pangborn Cloth Bag Dust Collector. And they're efficient! The cloth filter has proved the most practical method for collecting finely divided dry dusts. But Pangborn goes a step further. Pangborn engineering has not only adapted this design to increase its collecting effectiveness but has simplified its construction. This means you save money. The Pangborn Cloth Bag Collector offers maximum efficiency, yet is economical to buy, install and operate.

Pangborn engineering is important to every dust-producing plant, regardless of the kind of collector needed. It is not enough to put a dust collector within a plant. An efficient dust collecting system must be *scientifically* planned, designed and constructed to handle effectively a specific dust problem. This thinking is incorporated into every Pangborn proposal.

The Pangborn Engineer in your area will be glad to go to work for you. He is a dust expert *and will discuss your individual problem at no obligation. And, for more information, write for Bulletin 922 to:* Pangborn Corp., *3200 Pangborn Blvd., Hagerstown, Md. Manufacturers of Dust Control and Blast Cleaning Equipment.*

Pangborn CONTROLS DUST

For more facts circle 619 on Reply Card

safest !
If the new Remington Captive Stud Tool is accidently fired into inadequate base material . . .
Captive Stud Guard Assembly prevents free flight of stud, which is locked to tool during firing.

New exclusive guard assembly makes the

Remington Stud Driver

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DATA FILE

(Begins on page 186)

processing equipment. Cutaway drawings and an installation diagram. Chemical and Power Products, Inc.

327 Piston Packing — Sixteen-pp Bulletin 5503 presents engineering data on Darcova Pumcups for packing pistons of air cylinders, hydraulic cylinders and reciprocating pumps. Included are operating diagrams and a list of typical installations, as well as helpful data on Pumcup compositions, textures and types made available for specified pressure, other conditions. Darling Valve & Mfg. Co.

PUMPS, COMPRESSORS

328 General Purpose Pumps—Section B, 36 pp, describes rotary pumps for general purpose use. Explains positive displacement principle incorporated, gives suggestions for selecting proper materials of construction. Application and ordering information is provided on mounted and unmounted small pumps, large mounted pumps, pumps for operations requiring greater sealing, and large, totally enclosed models. Viking Pump Co.

329 Liquid Ring Pump—Bulletin 725.6 describes light weight, self-priming, portable or permanent liquid ring pump for transfer and similar jobs, which handles air alone, liquid alone or any air-liquid combination. Specifications, performance and construction data are included. Gould's Pumps, Inc.

330 Multi-Stage Pumps—Catalog B-100 describes company's line of vertically split case, multi-stage pumps. Design and construction features are described and performance curves given. Economy Pump Div., C. H. Wheeler Mfg. Co.

331 Continuous Flow Pump—Bulletin 30-C, 8 pp, outlines advantages of company's Moyno pumps which handle a variety of materials—from free-flowing liquids to non-pourable pastes, abrasives, solids. Describes principle of operation, discusses performance, construction, capacities, specifications. Robbins & Myers, Inc.

332 For Abusive Pumping Jobs—Catalog 5206, 44 pp, covers centrifugal pumps for wide industrial use and especially adapted to handling ashes, abrasive mixtures, slurries, hot and corrosive liquids. It describes several basic types; a horizontal shaft, single-stage end suction pump; a horizontal shaft, single-stage, rear-entrance automatic priming pump; vertical shaft pumps with standard, overhead and quill bearings. Nagle Pumps, Inc.

334 Single Suction Pumps—Ball bearing single suction pumps are illustrated and described in 24-pp Bulletin 976-G. General data and specifications are included, as well as rating tables, outline dimensions, sec-

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Rotron Research Corp. of Woodstock, N. Y., uses several dozen Strobotacs continuously in the design and production testing of its small fans and blowers, which are used in the cooling of electronic equipment. Typical tests include:

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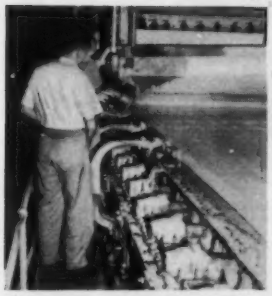

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DATA FILE

(Begins on page 186)

tional reference drawings, and other features. Buffalo Pumps, Div. Buffalo Forge Co.

336 Pump Data—Featured in Bulletin 250 are centrifugal pumps, reciprocating pumps, screw pumps and rotex pumps designed for pulp and paper, boiler plants, marine, chemical, food, pipeline, textile and other applications. Typical applications for each pump in the line are listed, as well as range and construction. Warren Pumps, Inc.

338 Low Pressure Compressors—Eight-pp Bulletin A-95 describes a line of low pressure compressors for heavy duty industrial applications. Engineering design features are detailed. Joy Mfg. Co.

DUST CONTROL

340 Industrial Dust Control—Bulletin 104, 36 pp, on company's dust filters, gives detailed information about dust control systems and how to engineer them. Includes description of the Roll-Clean Dynaclone dust filter, as well as information, capacities and dimensions for other Dynaclone and automatic continuous dust filters, intermittent filters, others. The W. W. Sly Mfg. Co.

341 Industrial Dust Control—A wide variety of collection methods for industrial dust control is described in 16-pp Bulletin 922. A typical case history is included as well as photos, cutaway views, drawings and capacity data. Pangborn Corp.

342 For Dust Collection—A collection of product sheets providing application suggestions and specifications on Dustkop equipment designed to solve a wide range of dust handling problems is provided in the Series 700 bulletins. Various models are described. Aget Mfg. Co.

343 Dust Collectors—Operation, construction, versatility and maintenance of company's unit dust collectors are explained in this bulletin. The Kirk & Blum Mfg. Co.

344 Improved Dust Separator—Bulletin 576, 12 pp, describes advantages of company's heavy duty high efficiency centrifugal dust separators. In addition to covering design improvements and applications, it features air flow resistance and dust recovery curves, temperature and pressure correction formula, selection chart, dimensions, supports and accessories. The Day Co.

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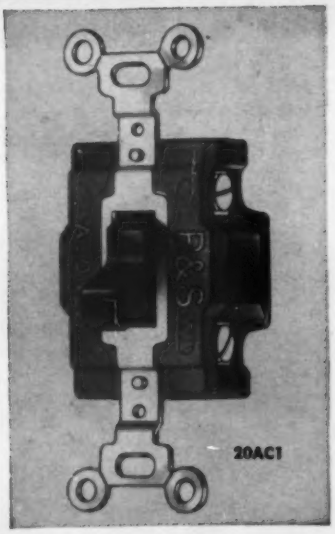

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HEATING, VENTILATING AND AIR CONDITIONING

346 Unit Heaters—Catalog 158, 28 pp, contains performance and application data on company's line of unit heaters, including design and construction details, dimension diagrams, and tabulated information on steam capacities, conversion factors, hot water capacities, performance factors. Modine Mfg. Co.

347 Industrial Heaters—Advantages and features of a line of industrial heaters for space heating, drying, make-up air and oven applications are detailed in this illustrated bulletin. A cutaway view points out essential design features, and tables of dimensional data and engineering data included. Lennox Industries, Inc.

348 Electric Heating—Bulletin 975A, 12 pp, outlines advantages of electric heating and describes a number of different methods, such as radiant, convection, radiant and convection and forced hot air. Commercial and industrial applications are pictured, and specification and dimensional data included. Edwin L. Wiegand Co.

349 Suspended Type Heaters—Eight-pp Bulletin 563 features gas-fired suspended type unit heaters for a wide range of industrial applications. Specifications, physical data and ratings are tabulated, as well as capacities for blower assemblies. Dravo Corp.

350 Unit Heaters—Eight-pp Bulletin UH858 contains detailed information on company's line of gas-fired unit heaters for a variety of applications. Design and installation data is

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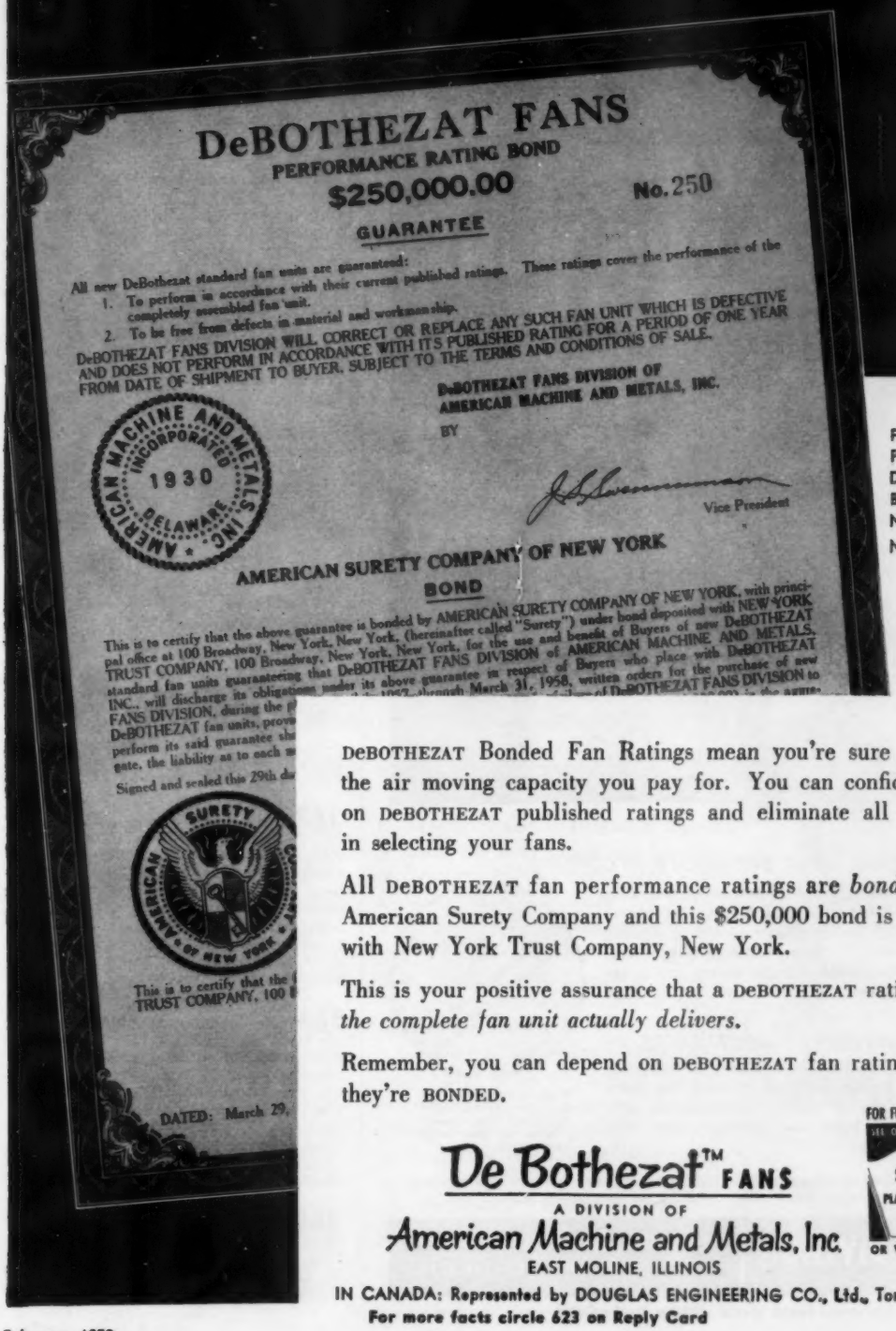

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DATA FILE

(Begins on page 186)

given, as well as performance results, dimensions. Grinnell Co., Inc.

351 Direct Fired Heaters — Complete description and specifications on unit heaters, duct furnaces and heavy duty heaters are presented in 12-pp Bulletin A1-1.2b. Cutaway views and construction features are included. Reznor Mfg. Co.

353 Heat Transfer Equipment — Cast iron steam heat transfer equipment, including unit heaters, blast heaters, and radiators, is featured in 40-pp Catalog 956. Construction details are illustrated and described, and graphs, dimensional data, heating capacity tables, conversion factors, piping diagrams, installation data included. D. J. Murray Mfg. Co.

354 Air Conditioning Units—Bulletin 786 contains 54 pp of selection data on air conditioners, including capacities, standard arrangements, dimensions, etc. Steps in selection of basic unit and components are outlined. First pages are devoted to choosing the physical size based on air capacity and face velocity requirements, while succeeding pages concern themselves with heating and cooling requirements, control. American Air Filter Co., Inc.

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...will answer all your enclosure problems...

Here is the new, easier, simpler method of guarding conveyors and machines and for all in-plant partitioning. Shipped READY for erection, no cutting, drilling or welding required . . . these interchangeable expanded metal panels provide greater safety, cut overall costs, cover a wider range of use and require 85% less storage space.

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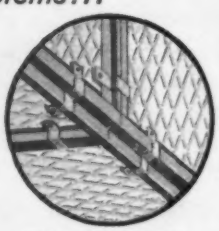

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MAINTENANCE

355 Basic-Roofing Information — "What You Should Know About Your Roof" is a 40-pp clearly illustrated booklet which tells what makes a roof fail, how to recognize signs of roof deterioration, what to do to keep a roof in good condition. Discusses roofing practices. Johns-Manville.

356 Handbook on Coatings—This 1958 Coating Manual is a 32-pp treatise highlighting the stopping and preventing of rust on nearly all types of rustable metal. Book contains information and recommendations to enable determination of specific coatings needed. Basic principle of Rust-Oleum's fish oil penetration into metal is shown. Contains 100 color chips. Rust-Oleum Corp.

358 For Overhead Maintenance—Bulletin G205RR, 8 pp, tells how to control costs when maintenance goes above arm's reach—for painting and cleaning, electrical work, etc. Pictures a variety of scaffolding arrangements. Provides brief product information on steel and aluminum scaffolding, ladders. The Patent Scaffolding Co., Inc.

359 Vacuum Units — This bulletin describes heavy-duty, portable vacuum units designed for a variety of plant housekeeping jobs. Application in removing litter, conveying or reclaiming materials, and collecting hazardous matter is covered. Invincible Vacuum Cleaner Mfg. Co.

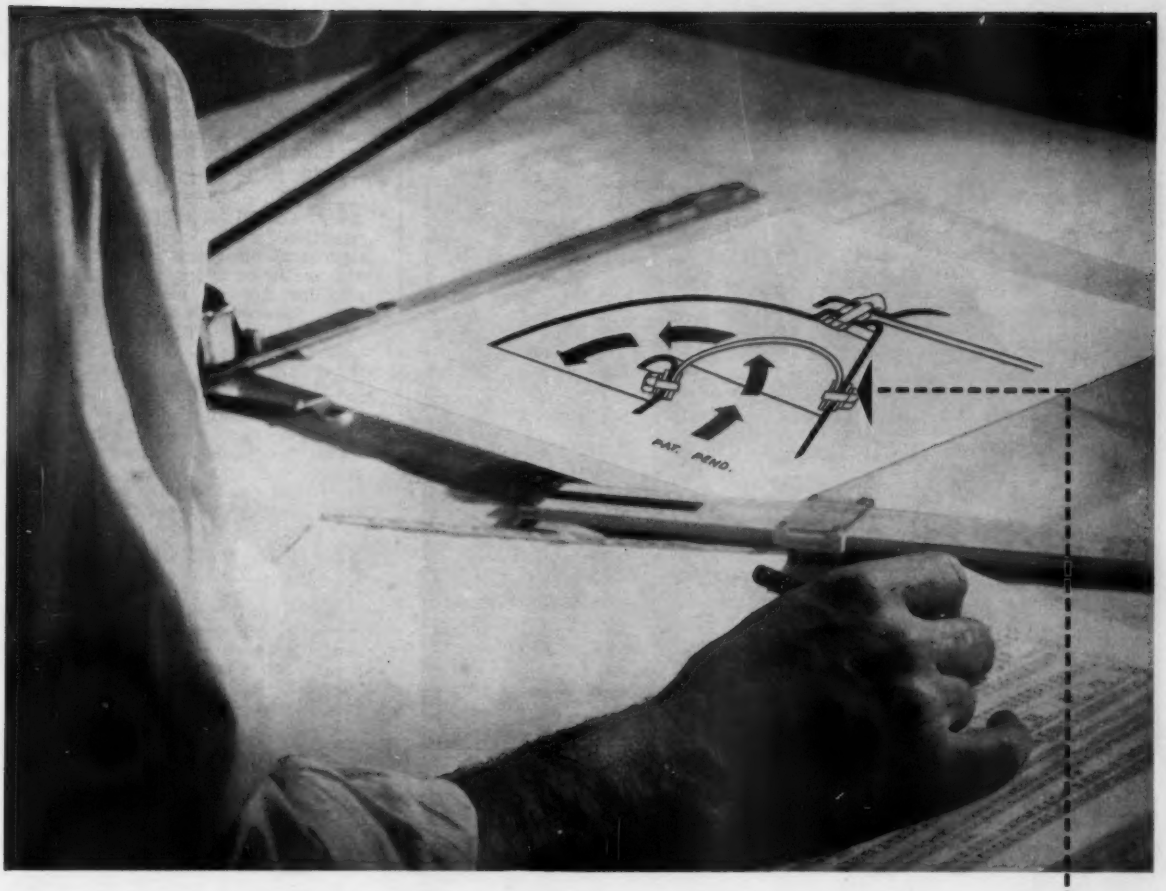
CONSTRUCTION

362 Pole-Type Buildings—Easy steps in building pole-type industrial and other buildings are presented in this 8-pp pocket-size booklet. Deals with uses of pressure-treated, rot and termite resistant poles and lumber. Contains practical step-by-step guide, with diagrams, covering site location, pole setting, roof construction, splash boards, application of siding. Wood Preserving Div., Koppers Co., Inc.

363 Functional Glass—Advantages of company's rolled, figured and wired glass for vertical sidewall and skylight glazing are detailed in Catalog 59-G, 20 pp. Describes types suited for commercial, institutional, industrial applications. Provides transmission data, light distribution properties, photos of patterns. Mississippi Glass Co.

364 Replacement Glazing—Twelve-pp Booklet PL-251 gives detailed information on glazing industrial and other buildings with flat panels of the acrylic plastic, Plexiglas. Written for plant engineers concerned with frequent breakage of windows or other glazing problems, this practical booklet gives properties of this sheet. Plastic Dept., Rohm & Haas Co.

366 Insulated Curtain Walls—Technical Manual 2786 contains description, details and application methods of Gold Bond Asbestostone Panels. Includes specifications as well as pho-



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U-spring suspension absorbs 44% more vibration than rubber isolators

...and only Jenn-Air Exhausters have it!

There are two reasons why vibration isolation is a critical factor in exhauster design. *First,* any reduction in vibration results in a corresponding decrease in noise—an important consideration in restaurants, schools, hospitals and similar installations where quiet operation is a must. *Second,* excess vibration causes wear and tear on motors, blades and other moving parts, cuts exhauster life expectancy.

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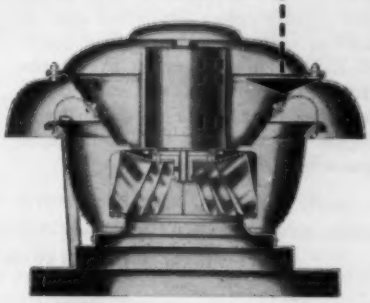

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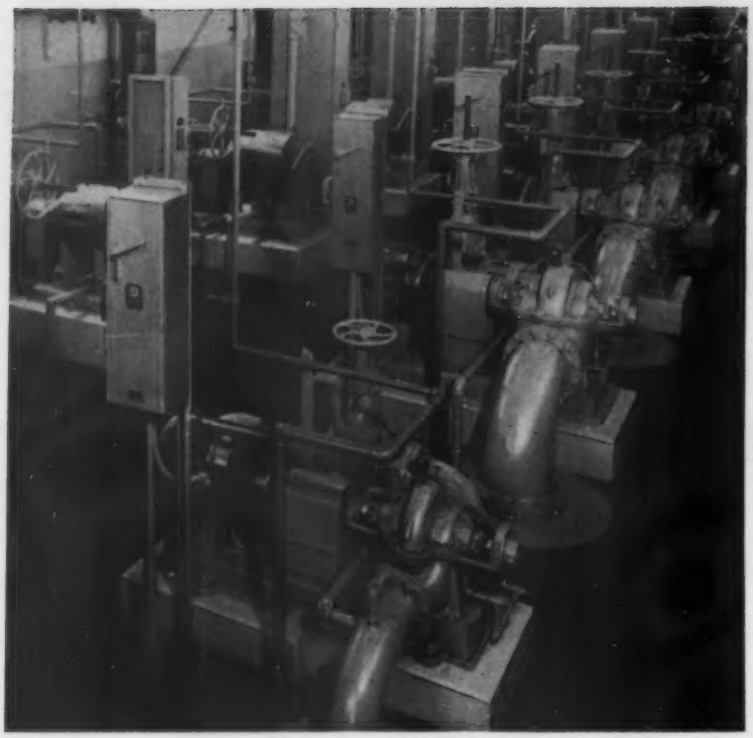

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You'll find two postage-free Reader Service Cards on pages 181-182. Use them for ordering product information — just circle item numbers of the catalogs or bulletins you would like to have. You may also use the cards for requesting advertising catalogs.

DATA FILE

(Begins on page 186)

tographs and dimensional drawings showing construction details. National Gypsum Co.

367 **Fir Plywood**—This 34-pp construction guide contains full-page structural drawings providing basic informatin on types, grades, and applications of fir plywood. Booklet covers information on floor construction. Douglas Fir Plywood Ass'n.

369 **Fiber Glass Panels**—Technical data and installation procedures for fiber glass reinforced plastic glazing panes are presented in this illustrated brochure. Outlines product's mechanical and physical properties and heat and light transmission. Filon Plastics Corp.

370 **Unit Wall Construction**—Twelve-pp Technical Bulletin UW-100-5 describes and illustrates application of company's Uniwall for complete single unit, moderate cost, wall construction in buildings of all types. The bulletin contains construction details and performance data. Natco Corp.

371 **Aluminum in Colors**—This bulletin introduces Alcoa's Alumalure colored aluminum architectural building sheet products, a complete line of sheet products offered in 11 colors. Five of the newly developed hues are pigmented aluminum to impart a soft, pleasing metallic appearance. Aluminum Co. of America.

373 **Steel Floor Plate**—Skid resistance and other advantages of USS multigrip rolled steel floor plate are stressed in this illustrated bulletin. Also gives dimensions, data on allowable loads. United States Corp.

374 **Non-Slip Flooring**—Algrip, an abrasive rolled steel floor plate described as non-slip even on steel inclines, is the subject of Booklet AL-29, 8 pp. Discusses safety features, fabricating. Alan Wood Steel Co.

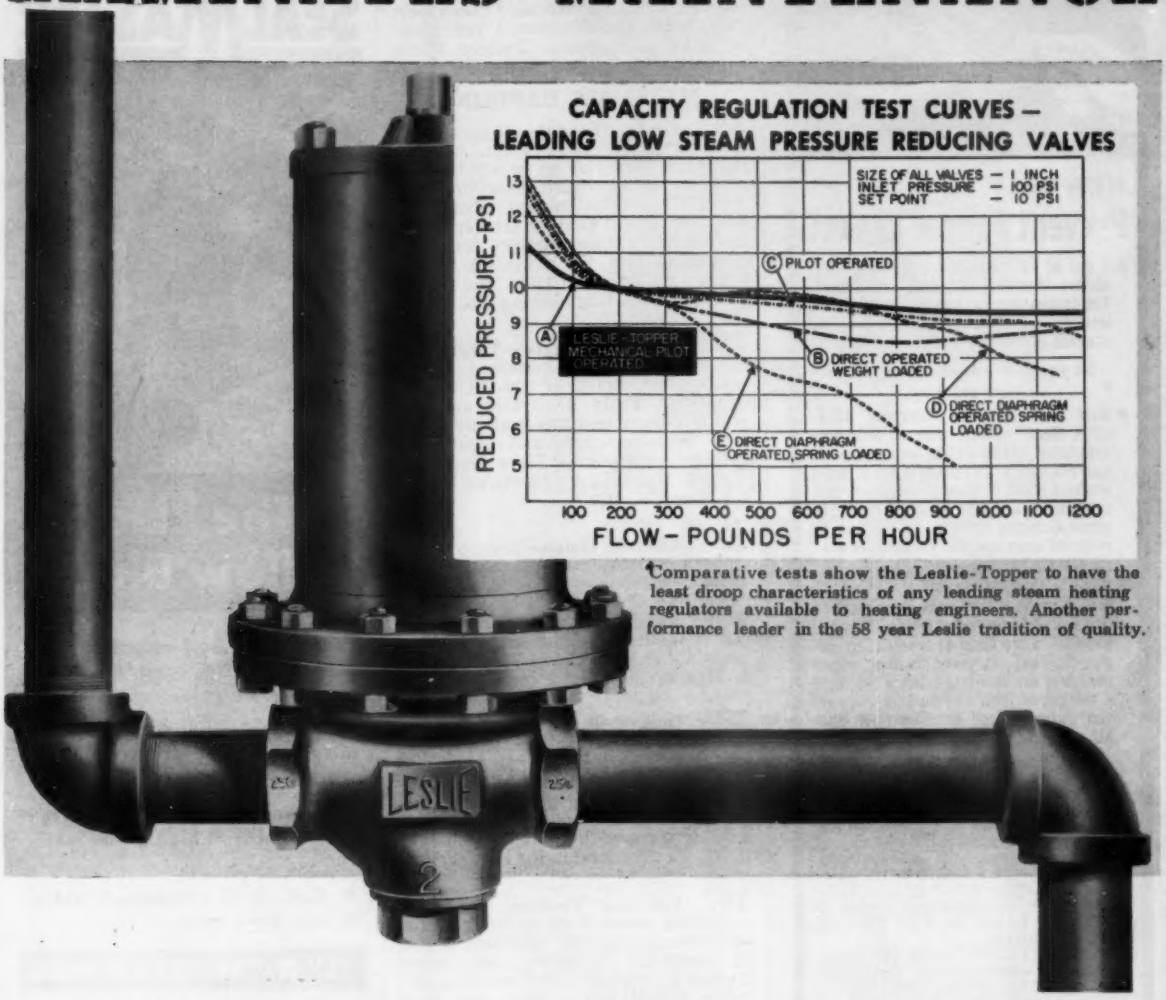
375 **Foundation Pipe Piles**—Comprehensive information on Taylor Forge spiral-weld foundation pipe piles is presented in 24-pp Form F-5677. In addition to detailed specifications, the illustrated booklet describes a number of pipe-pile installations and includes driving logs. L. B. Foster Co.

377 **Retaining Walls** — Sixteen-pp Catalog RW-3558 presents all-steel bin-type retaining walls for slope control retention of built-up land, erosion control and other earth retention jobs. Includes technical data, drawings, applications and case histories. Armco Drainage & Metal Products, Inc.

379 **Guide to Shelving**—To assist plant engineers in selecting proper shelving for all storage requirements, 64-pp Catalog 30 offers detailed sug-

revolutionary pressure reducing valve with mechanical pilot out of steam path

ELIMINATES MAINTENANCE



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Now . . . a mechanical pilot operated reducing valve with direct operated simplicity and steam pilot accuracy . . . proven in comparative tests with other leading regulators a new concept in maintenance-free steam pressure reduction . . . the LESLIE-TOPPER

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★ Now, NEW (Patented) 'Sexauer' SELF-LOCK Monel screws, with an imbedded expanding NYLON PLUG, lock at the required depth AUTOMATICALLY, hold washers FIRMLY! Made of rustproof, non-corroding Monel, heads don't twist off, screw slots don't distort. They are easily removed when necessary, can be re-used repeatedly.

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Faucet leaks are costly! As authenticated by Hackensack, N. J. Water Co. and American Gas Association, stopping just ONE PIN-HOLE SIZE (1/32") LEAK can reduce water waste 8,000 gal. quarterly. If a HOT WATER FAUCET LEAK, water and fuel savings JUMP to over $7.58 QUARTERLY—plus additional savings on MATERIALS, LABOR and costly FIXTURE REPLACEMENTS!

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WORLD'S LEADING SPECIALISTS IN PLUMBING AND HEATING REPAIR PARTS

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DATA FILE

(Begins on page 186)

gestions for correct shelving and storing materials, loose and packed parts, record files. Shop equipment and storage cabinets are also described, and instructions included for planning of stockrooms. Deluxe Metal Furniture Co. Royal Metal Mfg. Co.

MATERIALS HANDLING

381 For Overhead Handling—Booklet 2008-M, 12 pp, is replete with illustrative material on principal components of overhead handling systems. Track design and advantages of supporting it flexibly are described, and formulas and figures for comparing various track systems given. Cleveland Tramrail Div., The Cleveland Crane & Engineering Co.

383 Electric Hoists—Twelve-pp Bulletin DH 133B describes Speedway electric hoists of 500- to 4000-lb capacities. Fully illustrates and explains design features and gives details on suspensions and conducting systems. Clearance data included. Wright Hoist Div., American Chain & Cable Co., Inc.

384 Electric Hoists—Six-pp illustrated Bulletin 905 describes R&M Type J electric wire rope hoists in capacities of ¼, ½, 1 and 2 tons. Shows complete specifications including mounting options and sectional drawing. Hoist & Crane Div., Robbins & Myers, Inc.

386 Deck Crane—Bulletin 515 describes safety features incorporated into company's all-electric powered deck cranes for serving stationary and mobile drilling platforms. Typical applications are illustrated and a table of general data is included. R. G. Le Tourneau, Inc.

387 Vibrating Feeders, Conveyors—Catalog 930 is a 96-pp book which extensively outlines company's line of electrical vibrating equipment. Covers hourly capacities, electric controls, dryers and coolers, bin level indicators and barrel packers. Principles of operation and deailed specifications are amplified by numerous photos. The Jeffrey Mfg. Co.

388 Oscillating Conveyors—Book 2744, 24 pp, is devoted to company's Flexmount, Coilmount and Torqmount conveyors. These oscillating conveyors cover a material capacity range from 25 to 350 tons per hour. Product information provided includes trough widths, depths, section lengths, accessories and selection and application data. Also included is discussion of oscillation as a preferred method of conveying hard-to-handle materials. Link-Belt Co.

389 Steel Conveyor Belts—"A profitable approach to the selection of the subject of this 16-pp bulletin. Simplified selection, standard specifications, and installation information. The Colorado Fuel and Iron Corp.

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For more facts circle 629 on Reply Card

390 Conveyor Belt Carrier—Bulletin 355, 20-pp, features comprehensive technical data, specifications and illustrations on conveyor belt carriers for conveying bulk materials. Dimensional data and diagrams are included. Stephens-Adamson Mfg. Co.

391 Automatic Bulk Handling—Bulletin 530, 32 pp, on Air stream conveyors, presents information showing how pneumatic conveying has solved many bulk handling problems. System diagrams of typical installations point out applications and flexibility of conveyors. Over 70 illustrations show how air transports material. Dracco Div., Fuller Co.

392 Vertical Transportation — Selection of vertical transportation for every traffic-moving job is detailed in 32-pp Bulletin A-382. Various types of elevators and escalators for a variety of commercial and industrial applications are described and dimensional diagrams illustrating arrangements included. Recommended sizes are listed. Otis Elevator Co.

393 Sheet and Coil-Lifters—Bulletin SL-30, 16 pp, illustrates and describes various types of standard and semi-special lifters for one-man or automatic handling of sheet and coil stock. Advantages and design features are detailed and tables listing dimensions included. Cullen-Friestedt Co.

395 Material Handling—Sixteen-pp Catalog 90 covers a diversified line of corrugated steel boxes, skids and pallets for unit load handling. Design and application ideas to help speed production and solve specific handling problems are presented. The Union Metal Mfg. Co.

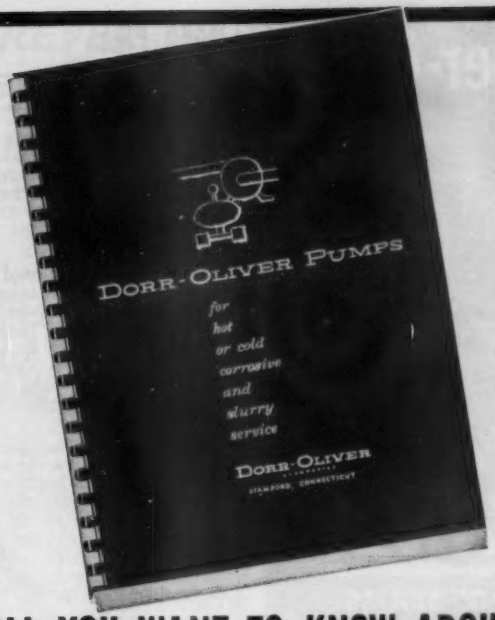
396 Boxes and Trays—Contained in this folder are separate data sheets on company's line of boxes and trays for moving, storing and drying. Advantages of construction and design are illustrated, and dimensional data and specifications included. Molded Fiber Glass Tray Co.

398 Self-Dumping Hopper — Described in Bullein 260 is a self-dumping hopper for low-cost handling of wet or dry, hot or cold, bulk materials. A variety of standard models are pictured and described and data furnished. Roura Iron Works, Inc.

MECHANICAL POWER TRANSMISSION

400 Chains, Sprockets—Catalog 757, 68 pp, on company's stock roller chains and sprockets, stresses advantages gained through roller chain use, and pictures some typical roller chain drives. Tells how to select a stock roller chain drives. Provides specifications, ratings, prices and engineering data required for ordering. Book is generously illustrated with photos. Diamond Chain Co., Inc.

402 Dry Fluid Drives — An expanded line of dry fluid drives and couplings is described in 24-pp Bulletin A-640B. Complete with product



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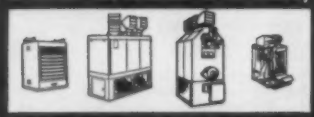

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DATA FILE

(Begins on page 186)

photos and engineering drawings, installation pictures showing applications in a broad cross-section of industry, it explains how this device solves many difficult drive problems. Dodge Mfg. Corp.

405 Flange Mounted Drives—Bulletin 7140 contains selection data for flange mounted drives for a variety of applications. A load classification table is included, as well as tables of minimum sheave pitch diameters, load location factors, overhung load capacities. The Falk Corp.

408 Transmission Belting — Application information on company's line of transmission belting is presented in 16-pp Bulletin S-5174. Specific types of belting for a variety of applications is illustrated and described, and technical data tables, and a selection table for drives included. The Goodyear Tire & Rubber Co.

409 Cylindrical Roller Bearings—Multi-Row cylindrical roll neck bearings are described in 24-pp Form 436. Contains complete engineering and technical data on cylindrical roller bearings designed for heavy-duty service in roll neck mountings in rolling mills. SKF Industries, Inc.

410 Flexible Couplings—Condensed Engineering Catalog 51-A contains excellent data on the choice and use of company's flexible metal couplings for power transmission. Tells advantages of these couplings and discusses design. Thomas Flexible Coupling Co.

LIGHTING, COMMUNICATION

411 Architectural Floodlighting — Eight-pp Bulletin GEA-6437 illustrates various methods of floodlighting industrial plants, public and commercial buildings and others. Provides information on general purpose models. General Electric Co.

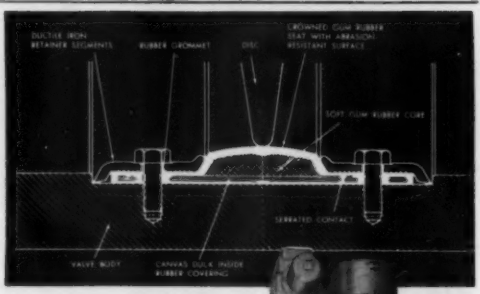
414 Communication System—Featured in this bulletin is a transistorized communication system designed to provide communication between two or more persons or departments regardless of distance or surrounding noise conditions. Operating and equipment features are detailed, as well as economy of installation. Gai-Tronics Corp.

415 Signal Equipment — Tips on how to select suitable signals for any specific operations are offered in Bulletin 100. Describes horns, bells, warning lights, other signal equipment. Specifications, photos, wiring diagrams, dimensions, audibility rating charts, electrical characteristics. Federal Sign & Signal Corp.

ELECTRICAL

417 Secondary, Service Cable—Bulletin RCP-361, 8 pp, on neutral-sup-

DRIP-TIGHT SHUT-OFF *with* ROCKWELL *BUTTERFLY VALVES*



The matchless new "Wedge-Lock" rubber seating provides drip-tight shut-off in Rockwell Butterfly Valves. Its unique construction makes leak-proof closure sure and safe. Valves can be made with full rubber lining.

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ported secondary and service drop cables, provides specifications for both types, including scope of use, conductors, insulation, construction, tests and put ups. Charts show number of strands, insulation thickness, size and type of messengers, current carrying capacity. Rome Cable Corp.

419 **Butyl Insulation**—Characteristics and advantages of butyl rubber as an insulating material for high voltage power cables are detailed in this 28-pp bulletin. Chemical and electrical properties of butyl are charted, as well as such qualities as aging resistance, ozone and corona resistance, and ampere tables are included. Wire and Cable Div., National Electric Products.

420 **Trolley Busway System**—Three bulletins offer help on electrical installations involving cranes and hoists, assembly and production lines, test lines and other moving electrical equipment. Bulletin 60, 40 pp, covers 60 amp systems; Bulletin 70, 32 pp, covers 225-500 amp systems; Bulletin 75, 44 p, covers 100 amp systems. Each includes special section on installation planning and procedure, mounting, and illustrations of equipment. Feedrail Corp.

422 **Switch Wiring Diagrams**—Bulletin 709 is a 36-pp booklet of typical wiring diagrams for across-the-line starting switches. Indexed and arranged for easy use, this booklet serves as a guide to some of the many ways in which this company's manual and magnetic across-the-line starters are used. Allen-Bradley Co.

423 **Small Motor Switches** — Detailed selection data on company's line of small motor switches are presented in this 14-pp Bulletin EA-114. Diagrams illustrate mounting details and tables list essential data. Cutler-Hammer, Inc.

424 **Pressure Switches**—Featured on this data sheet is a line of pressure switches designed to actuate instruments, warning signals, safety devices and make or break electrical circuits. Typical pressure switch dimensions are shown, as well as other data. John W. Hobbs Corp.

425 **Protective Relays**—Featured in 16-pp Catalog 5-020 are time delay overcurrent relays, directional inverse time overcurrent relays, differential relays, instantaneous overcurrent relays (adjustable setting), inverse time voltage relays, auxiliary relays, ac-dc definite time relays, and reclosing relays. For each model, tabular data and photos cover its applications, features, design, settings. Federal Pacific Electric Co.

426 **Distribution Equipment** — Detailed information on company's line of electrical distribution equipment is presented in this 82-pp '58 Marketeer, Catalog M-158. Among equipment described are Electrostrip multi-outlet assemblies, switches, lighting panelboards, power panelboards, switchgear assemblies, and various types of electrical duct. Tables of essential

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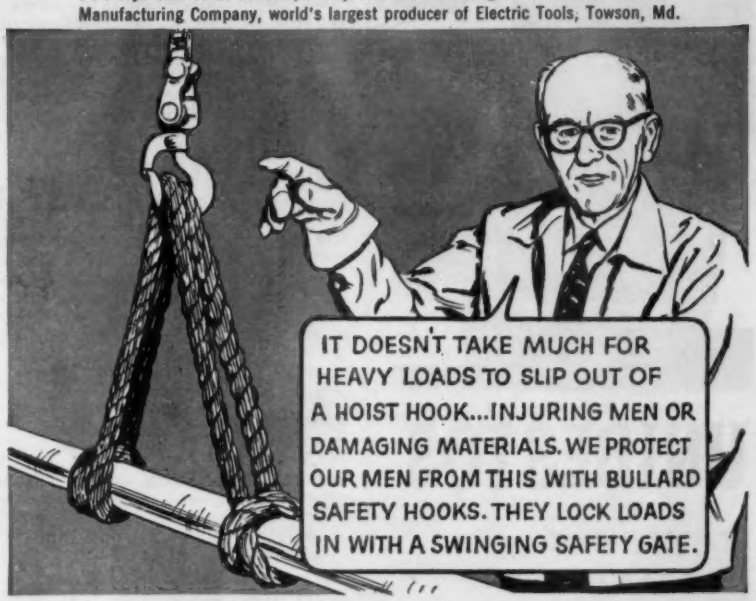
. . . says Charles S. Smickle, Safety and Health Manager of the Black & Decker Manufacturing Company, world's largest producer of Electric Tools, Towson, Md.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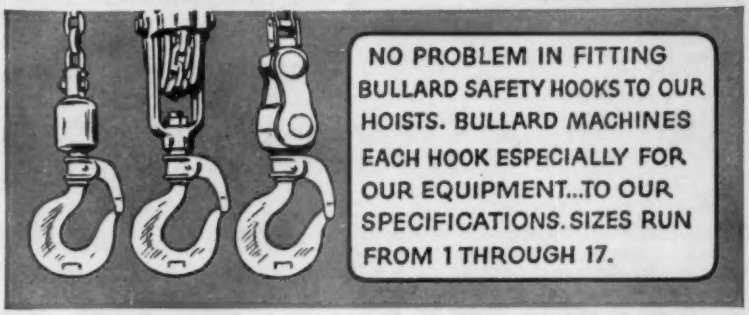
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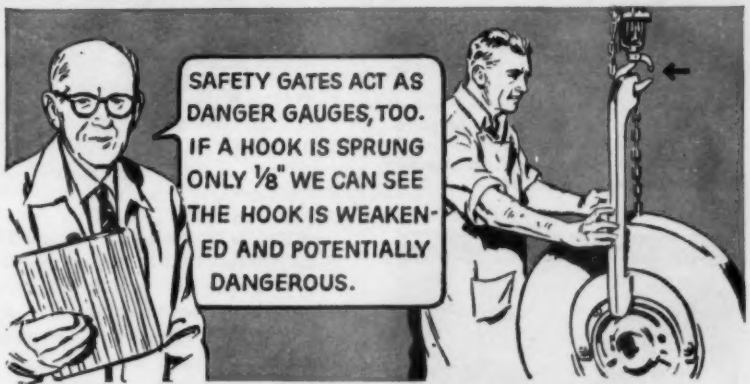
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DATA FILE

(Begins on page 186)

data. BullDog Electric Products Co., Div. I-T-E Circuit Breaker Co.

427 Hydraulic-Magnetic Breakers—Bulletin 301, 16 pp, describes advantages and operation of company's hydraulic-magnetic circuit breakers. Design and construction features are detailed and time-delay curves, specifications and dimensional data included. Heinemann Electric Co.

428 Portable Distribution System—Described in this 30-pp catalog is a portable distribution system for electric lighting and power, including such applications as portable lighting, heating and ventilation equipment, welding machines, power tools, and lighting transformers. System diagrams showing how each unit fits are included. Whitney Blake Co.

429 Electrical Equipment Digest—Electrical equipment illustrated and described in 160-pp Catalog Digest 142, includes load centers, circuit breakers, low voltage control, fusible service equipment and accessories, meter sockets and troughs, safety switches, panelboards, duct and fittings, starters. Square D Co.

430 Condulet Breathers, Drains—Bulletin 2702 describes condulet breathers and drains designed to remove moisture from electrical systems. Explains how breathers and drains add to life of explosion-proof equipment. Crouse-Hinds Co.

431 Wiring Devices—Catalog 60, about 80 pp, presents ordering data on wiring devices including a wide range of switches, convenience outlets, lampholders, fluorescent devices, cord connectors, adapters, wall plates, accessories etc. Fully illustrated with photos, catalog provides condensed information on feautres, dimensions, applications. Pass & Seymour, Inc.

432 Fuses for All Uses—This revised edition of manufacturer's complete line, Folder 3, includes illustrations and descriptions of fuses for every purpose. Features dual-element cartridge fuses for time-lag in protection against overloads, and delay renewable fuses and renewal links. Economy Fuse & Mfg. Co.

434 Battery Service Tips—Latest information on industrial batteries on cycle service, including industrial truck units, is provided in the new edition, about 40 pp, of company's industrial battery service manual. Includes photos, charts, tables, repair methods, maintenance, and salient points on operation, instructions covering repairs. C & D Batteries, Inc.

435 Battery Users Manual—Motive-power battery maintenance and repair is detailed in this newly revised

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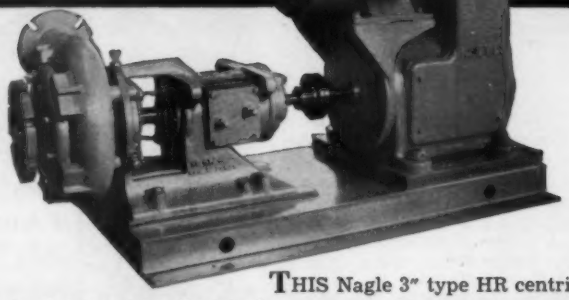

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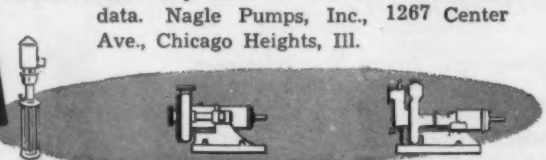

PUMPS FOR ABRASIVE AND CORROSIVE APPLICATIONS

For more facts circle 635 on Reply Card

edition of company's Battery Users Manual (Bulletin GB-1599A), 44 pp. Developed as a result of in-plant training courses, this book is designed to enable plant engineers to conduct an organized battery training course. Gould-National Batteries, Inc.

436 **Cable Troughs** — This 12-pp catalog offers a simple solution to any design problem of change of direction or elevation with a complete set of standard fittings, horizontal elbows, inside and outside vertical elbows, ties, crosses, covers and many special devices. The Globe Co.

437 **Cable Supports**—This information folder contains data on company's cable supporting equipment, telling how to install cable supports, giving advantages of cable trough. T. J. Cope Div., Rome Cable Corp.

BOILERS AND GENERATORS

438 **Self-Contained Boilers**—Bulletin AD-162, 8 pp, describes company's complete line of self-contained boilers for heating and processing steam or hot water. Design features and advantages are detailed and a cutaway view showing flow of air in the forced draft system is included. Cleaver-Brooks Co.

439 **Bent Tube Boilers** — Bulletin VF-VS2, 22 pp, describes a line of bent tube boilers designed to serve a wide variety of industries with diverse steam generating requirements. Principal data and schematic diagrams of typical installations included. Henry Vogt Machine Co.

440 **Package Generators**—Featured in this 6-pp bulletin is a line of package generators designed for hot water heating systems. General specifications are included, as well as dimension tables, clearances for typical layout, capacities. Cyclotherm Div., National-U.S. Radiator Corp.

441 **Boiler Construction** — Bulletin BE100 describes advantages of practical boiler construction with 2 pass design, featuring comparable results with equal heating surface, but with Continental's two-pass features—turbulent spinning gas technique-uniform heating-no refractory baffles and symmetry of furnace layout. Boiler Engineering & Supply Co.

443 **Decentralized Steam**—Bulletin C-730 presents a case history showing how decentralized steam generation saved space, installation and operating costs at a manufacturing plant. Details briefly the function of each of six steam generators in providing for space and process heating. Clayton Mfg. Co.

METALS

444 **Cast Alloys**—This 12-pp reference booklet describes many ways to get more out of high nickel alloy sand castings. Booklet is illustrated with easy-to-read charts and case histories of specific applications. The International Nickel Co., Inc.

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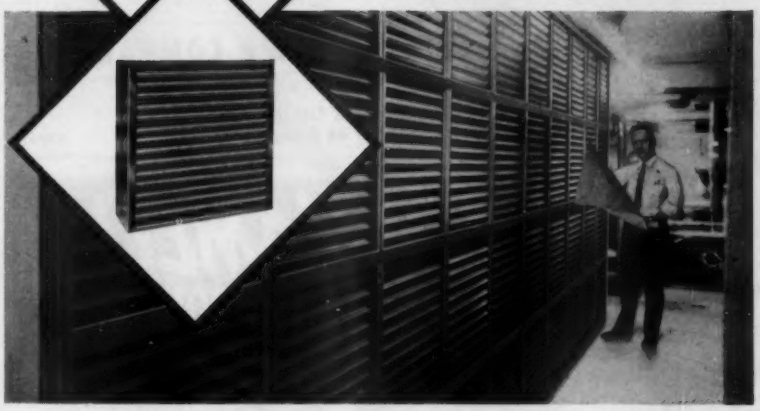

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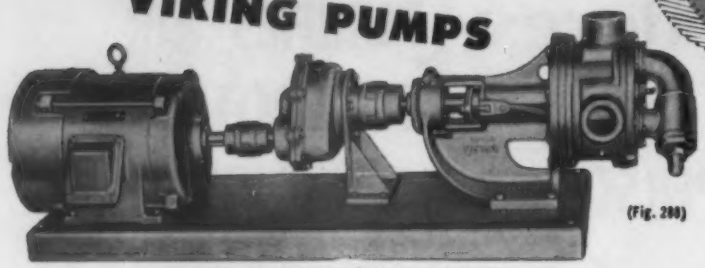

(Fig. 288)

35 - 50 - 90 - 150 G.P.M. Sizes

Addition of helical gear reductions makes Viking heavy-duty pumps more compact. Five gear reductions, easily interchanged, permit a wide range of pump speeds for handling thick or thin liquids. Gears run in a bath of oil, making quiet operation. Reducers are mounted separately . . . not supported on pump or motor shaft.

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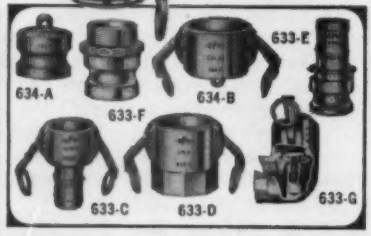

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DATA FILE

(Begins on page 186)

445 Aluminum and Steel Data—Comprehensive selection data on aluminum and steel available in stock for almost every application is presented in this 242-pp buying guide. Necessary weights, dimensions and descriptive data are tabulated. Individual sections cover structural shapes, construction products, plates, sheets, hot rolled bars, cold finished bars, alloy and tool steel, tubing, stainless steel, aluminum, industrial plastics, and others. Joseph T. Ryerson & Son Inc.

TOOLS, MACHINE SHOP

447 Powder Actuated System—Two booklets cover applications of a powder actuated fastening system. One booklet shows how it can be used for plant maintenance — fastening conduits, bus ducts, junction and outlet boxes, surface raceways, fixtures and frames, duct straps, fan and blower mounts, etc. The second booklet indicates the correct fastening and charge to use to fasten materials of varying thickness to concrete or steel. Ramset Div., Olin Mathieson Chemical Corp.

448 Pipe Tools—Ordering and application information on Ridgid pipe tools is provided in 16-pp illustrated Catalog 7596R6. Wrenches, cutters, threaders, reamers, vises, and others are pictured and described, also power drives, oilers. The Ridge Tool Co.

449 Portable Electric Tools—Form 10 features a complete line of portable electric tools including drills, screw-drivers, impact wrenches, magnetic drill presses, sanders, grinders, hammers, holesaws, and forged tools. The Black & Decker Mfg. Co.

450 Hydraulic Jacks, Pullers—Bulletin Hydraulic-56, 16 pp, features company's line of hydraulic jacks and pullers. Prepared as an application guide for using various high-pressure jacking and pulling tools, it contains full descriptions, mechanical specifications. Templeton, Kenly & Co.

451 Data for the Shop—"Fluids and Facts for Metal Working" is a pocket-size booklet of about 44 pp. A section on metal working fluids covers their function and selection, preparation and use of soluble oils and paste compounds, and prevention of dermatitis. Conversion tables, steel numbering systems, machinability ratings. Standard Oil Co. (Ind.)

PLASTICS, SYNTHETICS

453 Plastic Guide—An evaluation of the properties of company's phenolics and polyester thermosetting molding materials and industrial and coating resins, as well as fire-retardant resins for translucent panels and coatings, is featured in this illustrated bulletin. Durez Plastics Div., Hooker Chemical Corp.

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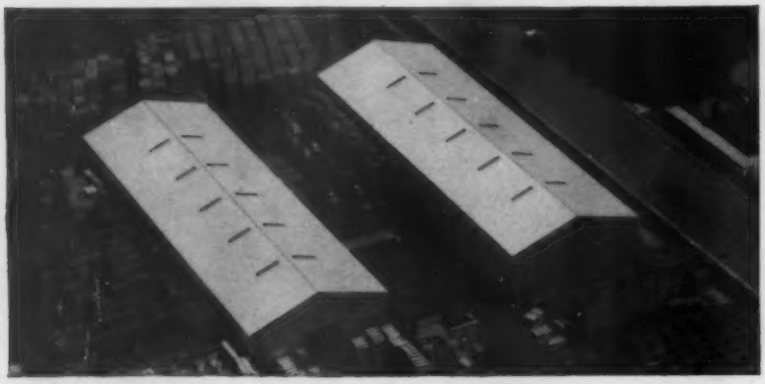

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DATA FILE

(Begins on page 186)

455 Silicone Rubber — Advantages offered by silicone rubber cables and wire are detailed in this 8-pp bulletin. Properties of silicone rubber insulated wires and cables are described, as well as applications and construction, and tables of engineering data are included. Rockbestos Products Corp.

FANS, BLOWERS

457 Mechanical Draft Fans—Eight-pp Catalog 1361 describes centrifugal fans designed for handling abrasive gases at elevated temperatures. Complete application, performance, and physical data are given, as well as a list of accessories. Sturtevant Div., Westinghouse Electric Corp.

459 Air-Moving Equipment—Bulletin DB 45-58, 20 pp, contains detailed information on company's line of roof ventilators, bifurcators, axial flow vent sets, and air jets. Bonded performance ratings are listed on tables, and dimensional data and specifications included, as well as photos, cutaway views and diagrams. DeBothezat Fans Div., American Machine and Metals, Inc.

460 Air Handling Units—Complete engineering information on company's low pressure sprayed coil and high pressure dry and sprayed coil climate changers is incorporated in 56-pp Bulletin PB-290. Detailed descriptions and illustrations on the all-purpose air conditioners for commercial and industrial comfort and process applications included. The Trane Co.

461 Ready Units—Catalog 515 provides 28-pp on complete, ready-to-run centrifugal fan equipment. Capacities 400 to 13,000 cfm, v-belt and direct drive units. Dimensions and capacities included. Clarage Fan Co.

462 Air Diffusers — Bulletin 30F presents information on company's air diffusers, high velocity valve attenuators, and air recovery equipment. Units are described and illustrated as to design requirements, dimensions, capacities, Connor Engineering Corp.

463 Industrial Fans—Bulletin 690-A, 12 pp, contains dimensions and application and performance data on direct connected fans for general and system ventilation and power roof ventilators, with air deliveries to 103,200 cfm. Design features and typical installations illustrated. Propellair Div., Robbins & Myers, Inc.

464 Blowers at Work—How units of company's California series of rotary positive pressure blowers and gas pumps are used to solve several air and gas handling problems is told in 8-pp Bulletin S-59G. Illustrated with photos and dimensioned drawing, bulletin shows a variety of applications. Also includes discussion of

Ni-Rod "55" weld saves 13-ft cast iron mill gear

...Also saves tough replacement job plus $8000 per day down time

Broken teeth are drilled, tapped and studded, for welding with Ni-Rod "55"* Electrode. This repair saves the damaged 13-ft dia. cast iron gear . . . plus the excessive costs of removing it from a pulverizing mill, opening a hole in a heavy concrete wall, waiting for new gear at a down time cost of $8000 per day.

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Ni-Rod "55" Electrode helps you make durable repairs in cast irons . . . solid production welds, too. Rarely do you need preheat to get sound, strong, machinable joints. See how other shops pare repair costs – write Inco for booklet "Repair Cast Iron Quickly and Easily."

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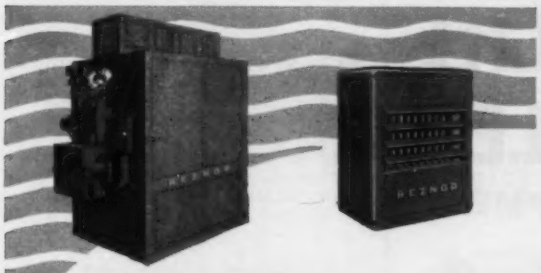

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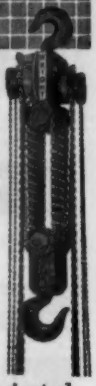

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Load Chain is finest alloy, every foot proof-tested...heat treated for hard wear-resistant working surface...ductile to withstand shock loads..."wick" lubricated...anti-rust zinc coat.

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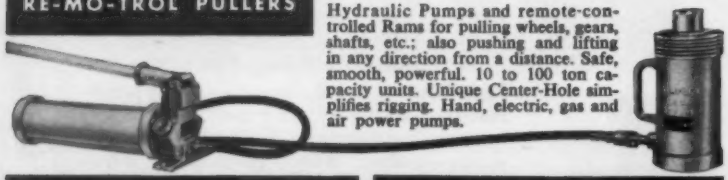

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DATA FILE

(Begins on page 186)

basic blower, its operation, construction, types of drive etc. A chart outlines performance examples of 20 blowers and pumps. Sutorbilt Corp.

INSTRUMENTS, CONTROLS

466 Motor Speed Controls—Eight-pp. Form 927B features motor speed controls for adjustable-speed operation of d-c motors from a-c lines. Applications and advantages are listed, operating principle is detailed. General Radio Co.

468 Gages, Needle Valves—Catalog 76-G consists of a loose-leaf bound collection of literature on gages and needle valves. Various types of gages are illustrated and described, with applications and specifications fully detailed. A section on accessories is included. Jas. P. Marsh Corp.

470 Precision Instruments—Catalog G1 contains 32 pp of comprehensive information on indicating, recording and controlling instruments. Contains descriptive and illustrative data on potentiometers, pyrometer supplies, systems and components, null indicators, amplifiers and oscillographs, pressure gages, flow and liquid level meters, pneumatic remote transmission, thermometers, panelboards, valves, diaphragm motors and motorized valve assemblies, motor and dampers, switches, etc. Minneapolis-Honeywell Regulator Co.

471 Graphic Instruments—Featured in 16-pp Catalog 657 is a line of graphic instruments designed to serve a variety of industrial measuring applications. Complete descriptive details on various types of recorders and accessories are included, as well as photos and ratings data. The Esterline-Angus Co., Inc.

OTHER EQUIPMENT

473 Industrial Finishing Equipment—Catalog A 657, 12 pp, describes a complete modern finishing system for cleaning, rust proofing, drying, painting and finish baking. The R. C. Mahon Co.

475 Cyclone Separators—Featured in 8-pp Bulletin 712 are company's

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cyclone separators and pipe line after-coolers designed to provide cool, dry and clean compressed air and gases. Cutaway views illustrate component parts and features, and capacity tables facilitate selection. Typical installations are also pictured. R. P. Adams Co., Inc.

477 **Equipment Selector Charts** — Bulletin CE-50, 20 pp contains selector charts on corrosion-resistant equipment for process industries. Tables cover general considerations in selection of material, physical properties, corrosion resistance, techniques and skill in manufacture of equipment. Describes rubber and plastic pipe, tubing and fittings; valves; pumps. Amerace Corp., American Hard Rubber Div.

On pages 181-182 are two postage-free Reader Service Cards provided for your convenience in ordering these catalogs. You may also use the cards to order any literature mentioned in ads.

479 **Fluid Power Circuits**—The 28-pp revised edition of the "Circuit Rider" describes representative types of fluid power circuits and the possibilities afforded by their use. Circuits cover sequencing, semi-automatic and automatic cycling, dual pressure systems, safety systems, skip feed arrangements, and synchronization of two cylinders. Logansport Machine Co., Inc.

481 **Heat Exchangers**—General information and selection data on company's line of heat exchangers designed for heating liquids with steam is presented in 12-pp Bulletin GN-1054. Applications are illustrated and described, and tables of ratings and dimensions given. Bell & Gossett Co.

482 **Permanent Magnetic Equipment**—Featured in this 32-pp bulletin is a line of permanent-powered, non-electric magnetic separators, magnetic automation equipment and vibratory equipment. A table of specifications and capacities is included, as well as photos and dimensional diagrams, dimensions and specifications. Eriez Mfg. Co.

483 **Sewer, Drain Machines** — Described in 12-pp Catalog 55 are company's sewer and drain machines for cleaning drain and supply lines. Features and advantages are illustrated and described, as well as typical applications. A line of accessories is also covered. Kollman Mfg. Co.

484 **Air Pollution Control** — Featured in this 8-pp bulletin are solutions to air pollution control and heat recovery through catalytic oxidation. Typical problems and solutions in organic finishing and drying, chemical industry, oil refinery industry, and food processing industry are detailed, and package catalyst units for all types of applications are described. Oxy-Catalyst, Inc.

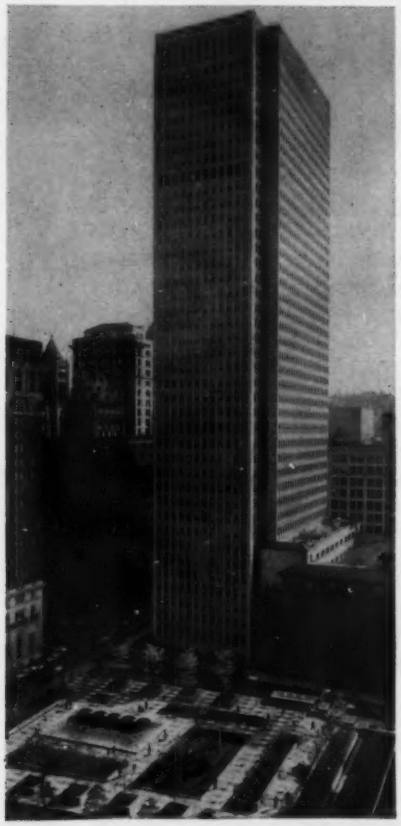
485 **Industrial Mixers** — Catalog B-109 contains 16 pp of application and design information on mixers for the process industries. Typical applications are illustrated and described, and detailed specifications included. Mixing Equipment Co., Inc.

486 **Corrosion Control** — Process Bulletin B6 discusses causes of condensate system corrosion and methods of corrosion control in steam condensate systems. Condensate corrosion inhibitors are illustrated and described. National Aluminate Corp.

488 **Waterless Washstation** — This large fold-out brochure illustrates and describes advantages of company's waterless washroom unit for hand washing on the job. Describes the waterless skin cleanser used, as well as the dispenser and waste receptacle. Sugar Beet Products Co.

489 **For Cleaner Furnace**—The use and application of Oxi Crystals to keep furnaces and the fireside of boilers free of slag, encrusted carbon, soot and fire-scale is described in a recently published pamphlet. Oxi Corp.

490 **Cooling Towers** — Featured in 20-pp Catalog DFA-58 is company's



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THE PLANT: 42-story office building at 525 William Penn Place, Pittsburgh. Hot-chilled water circulating systems contain steel risers, copper runouts, brass automatic valves; air condition 13,500,000 cubic feet of office space; circulate 14,000 gallons of water.

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DATA FILE

(Begins on page 186)

double flow Aquatower, combining high efficiency with low silhouette. Specifications and engineering data are included, as well as dimensional drawings showing construction features. The Marley Co.

491 Classifying Systems—This bulletin covers major advantages, industrial applications and design features of high efficiency classifying systems for efficient separation or dedusting of dry powdered materials. Includes details on operation, flexibility of arrangement, power requirements, construction. Buell Engineering Co., Inc.

492 Filtration Equipment—Eight-pp Bulletin GEO-506 describes filtration equipment for micronic clarification of all types of fluids; lubricating and fuel oils; liquid chemicals and petro-chemicals; compressed air, carbon dioxide, and other gases; hydraulic fluids; electroplating solutions; coolants. Commercial Filters Corp.

493 Products and Services—Bulletin GSP-901 24 pp, describes products and services of this company and its various divisions. These include ring balance instruments, components for control systems, electronic devices, force measuring devices, water and steam treatment, others. Hagan Chemicals & Controls, Inc.

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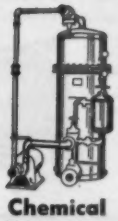

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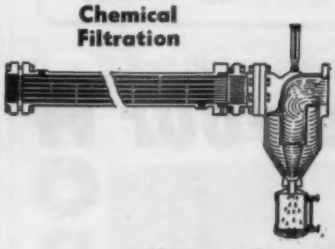

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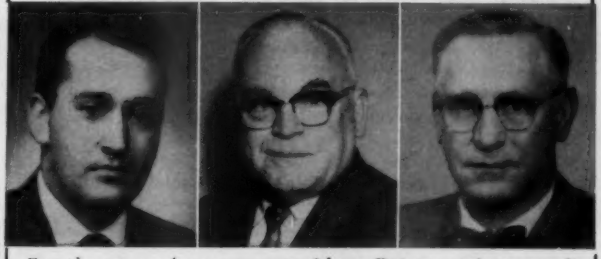

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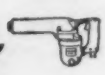
Black & Decker®
QUALITY ELECTRIC TOOLS



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FEDERAL, custom tailored the *Vibratone* to your expressed wish and suggestions.
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- is self tuning
- has full-range volume control
- installs almost instantly
- is extremely compact
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- is durable, trouble-free

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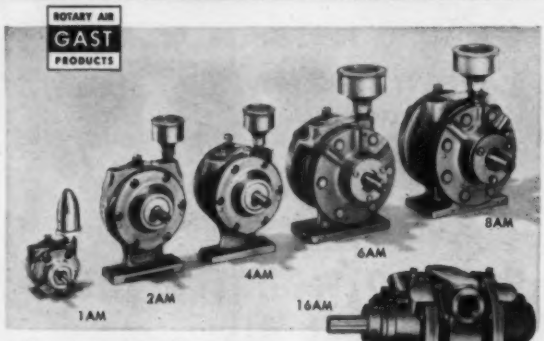

Six sizes . . . all variable speed, explosion-proof

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5. Vanes take up their own wear.
6. Reversible rotation (opt.) 5 sizes.
7. Very compact — light in weight.
8. Top-quality ball-bearing design.

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Model No.	H.P. at 90 PSI 2000 RPM	Weight lbs.
1AM	0.13	1½
2AM	0.57	5½
4AM	1.1	8
6AM	2.0	17
8AM	4.0	25
16AM	7.0	65

Gast Manufacturing Corp.
P.O. Box 117-U
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Write for Bulletins — specify models!

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• AIR MOTORS TO 7 H.P.
• COMPRESSORS TO 30 P.S.I.
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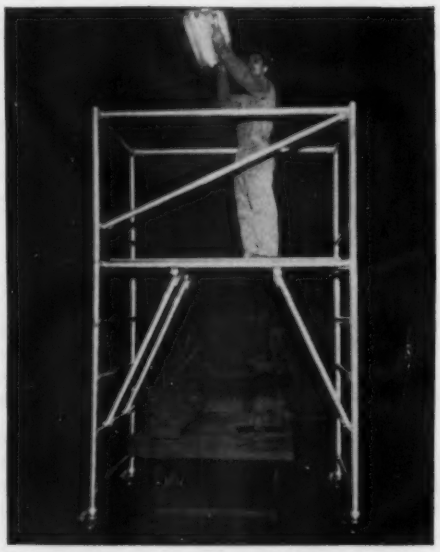
Aluminum Rolling Scaffold RAISES Efficiency ...LOWERS Maintenance Costs

Preventive maintenance is an economic necessity which accounts for millions of dollars of savings in equipment and materials each year. It can be costly in time, labor and life. However, when the job calls for getting off-the-ground . . . there's no safer, more economical way than with Aluminum Stairway Scaffolds. Scientifically designed, they are available in two basic styles. *Aluminum Sectional Scaffolds* are erected from separate frames, braces and stairways. All sections of "Fold-A-Way" Scaffolds fold into compact units. Base dimensions of both types are 4'6" x 6'. *Sectional Ladder Scaffolds* can be 29" or 4'6" wide in lengths up to 10'. Both styles are UL Approved. Shown at right: High clearance base section for all four scaffold types. Write for BULLETIN G-205RR



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GOLD MEDAL LADDERS SCAFFOLDING

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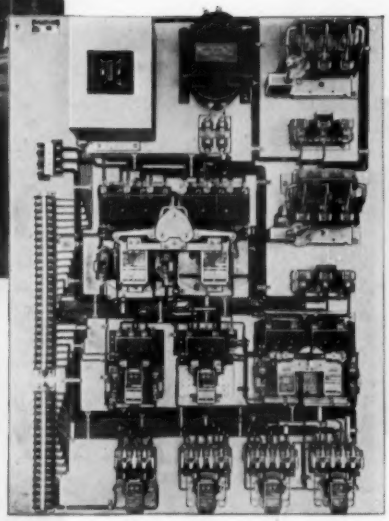
SQUARE D PRESS CONTROL

Built the Way You Want It!

Square D control is used by virtually every stamping press manufacturer in the country—and is approved by the three largest automobile manufacturers.

What's behind this preference for Square D? Biggest reason, we believe, is *completeness* of line which enables us to *custom build* to individual requirements, using *standard* control components. Actually, that has a bearing on a lot of things—including delivery, safety, uninterrupted production, maintenance parts standardization, plus field engineering service.

On the next press you buy, specify **SQUARE D CONTROL.**



above • **typical Square D press control panel, designed and built to customer specifications, using standard components**

NOW...EC&M PRODUCTS ARE A PART OF THE SQUARE D LINE

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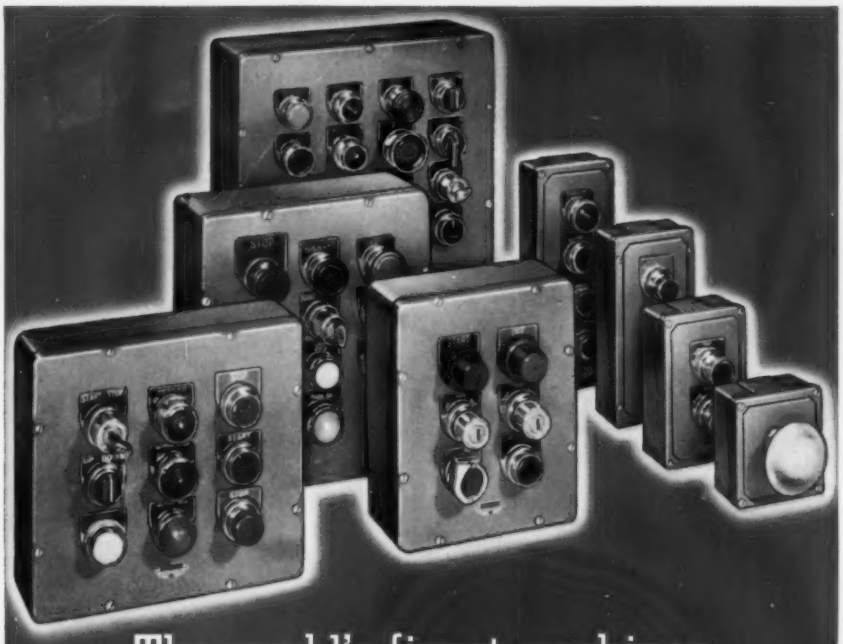
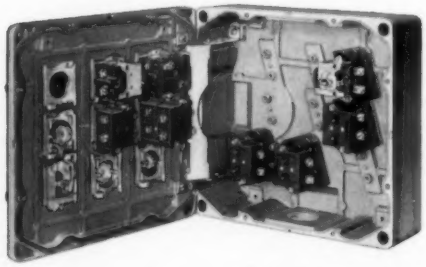


The world's finest machines are controlled from Cutler-Hammer oil-tight pushbutton Control Stations

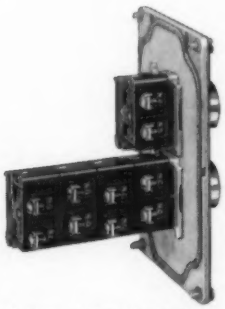
The Cutler-Hammer line of heavy duty oil-tight pushbuttons and precision die-cast control stations surpass anything ever before available to serve the needs of machine design engineers. Cutler-Hammer Oil-Tight Control Stations are precision die-castings to permit both base and one-hole mounting of the control units. The one to four element control stations are available in either the normal depth or the exclusive shallow depth for use where space limitations are critical.

Cutler-Hammer Pushbutton contact blocks are easily tandem mounted without special adapters, and use less behind-the-panel space than any other. Circuits can be arranged in any combination of NO and NC contacts.

Indicating lights come in a wide selection of colors with either plastic or glass lenses. Among the many special operators are: Roto-Push®, the combination pushbutton-selector switch; PresTest®, the self-testing indicating light; knob, key, lever, and coin type selector switches; flush, long, mushroom head, guarded, and palm type pushbutton operators. For further information, write on your company letterhead for the C-H Master Design, Pub. EL178-C-274... Cutler-Hammer Inc., Milwaukee 1, Wis.

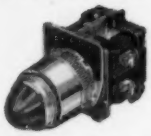


The hinged cover on the larger Oil-Tight Control Stations facilitates assembly and alterations. Precision die-castings permit both base and one-hole mounting of the control units. Raised edge on the box mates with the neoprene-cork cover gasket for a perfect seal.



Complete line of cover plates for cavity mounting. Compact contact blocks take 40% less space behind the panel than the next smaller element . . . additional blocks easily tandem mounted . . . from 2 to 8 separate circuits in any combination of NO or NC contacts.

Special Purpose Operators and Accessories



PresTest—the self-testing indicating light

Guarded mushroom head operator

Indicating lights, six colors available with plastic or glass lenses

Roto-Push—the one button control station . . . with or without lever ring in a deep precision die-cast enclosure

Selector switches—knob, lever, key, coin

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CONTROL
C-H

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MARCH, 1959

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